EVOLUTION AND MAN'S PLACE IN NATURE

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MAN'S PLACE IN NATURE

BY

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PREFACE TO SECOND EDITION

THIS Edition is virtually a new book, almost the whole having been re-written.

The criticism of the First Edition which most impressed me was that of the scientists who claimed that the lines of evidence in support of my conclusions should be given in greater detail. Not without reluctance did I contemplate this task, since much of the evidence to be handled is foreign to the province of one devoted specially to Mental Philosophy. At the same time, when the discussion passes beyond questions of Organic Evolution, and enters upon a contrast of Human and Animal Intelligence, the evidence of Naturalists and Physiologists requires attention from the Philosophic standpoint.

In view of this, I have felt bound to meet the demand of Scientific Critics for a full statement of the evidence in support of the conclusions I had reached. In submitting this, I have only to ask some consideration for the disadvantages encountered by one who passes through the territory of other specialists.

On account of the not inconsiderable portion of my professional life which has been devoted to a field of study

other than that which is properly my own, I have felt as if some apology were due to my colleagues in the Scottish Universities, with whom I share the responsibility of maintaining the historic position of Philosophy in the higher education of the nation. But it will be generally allowed that the work here attempted falls, not unnaturally, to the hands of those devoted to Philosophy, since students of Mental Science are concerned in the solution of outstanding problems, even more than those devoted to Observational Science, whether as Physiologists or as Naturalists.

In prosecuting the more extended task which has engrossed me for these three years past, I have had many obligations to own. I have, as on many previous occasions, been particularly indebted to my colleague, Sir William Turner, for the direction of my inquiries, and specially for facilities in comparing and in drawing examples of Brains.

For the use of illustrations to facilitate descriptions of Organic Structure, I have to acknowledge my indebtedness to Professor Claus, Vienna; Mr. Sedgwick, Cambridge; Professor Horsley, London; and Dr. Benham, Oxford. Figures used previously in my work on *The Relations of Mind and Brain* have also been introduced here.

I have throughout been indebted to my son, Mr. William L. Calderwood, for aid in my endeavours to appreciate the standpoint of the Naturalist, and particularly for the careful drawings of the Brain of the Ape and of Man in their natural size (page 265). These two drawings will, I anticipate, prove helpful to the reader, as they have been to myself in

preparation of the work. I have again to express obligations to my Class-Assistant, Mr. Charles Douglas, M.A., D.Sc., Lecturer on Philosophy in this University, for most helpful revisal of the proof-sheet .

To aid readers in testing the evidence traced, and the conclusions reached, I have supplied an extended Analytic Table of Contents. To my son I am indebted for a carefully prepared Index.

H. CALDERWOOD.

UNIVERSITY OF EDINBURGH,
4th January 1896.

PREFACE TO FIRST EDITION

IN this volume, I have undertaken discussion of the problem concerning Man's Place in Nature. The discussion proceeds from the standpoint of Evolution of Organic Life, as maintained by Mr. Darwin, and by Mr. Alfred Russel Wallace. The main objects are to trace the evidence of man's relation to the continuity of life on the earth, and to describe the distinctive characteristics of human life itself.

Not without misgivings and apprehensions, have I undertaken this difficult task. Not without diffidence, do I now submit the outcome to criticism. I fully recognise the demand which science makes on the teachers of philosophy, and I here humbly offer a contribution towards its satisfaction. Whatever of failure may appear in this attempt, I may have succeeded in so far opening the way through the entanglements encompassing our higher biological problems. I am not without hope that these pages may carry help to many who have found it difficult to reconcile with accept-

ance of evolution, their cherished convictions as to the responsibilities of rational life.

Since the publication of my work on *The Relations of Mind and Brain*, I have been closely occupied with the problem here discussed. During these years, I have been laid under deep obligation to many friends, whose valuable aid these prefatory lines enable me cordially to acknowledge. I have been specially indebted to my colleagues, Sir William Turner, Professor of Anatomy; Professor Rutherford, Professor of Physiology; and Professor James Geikie, Professor of Geology. I owe grateful acknowledgment to Mr. George Brook, Lecturer on Embryology in the University, for important suggestions bearing on his department of research. Throughout my investigations, I have been constantly indebted to my son, Mr. William Leadbetter Calderwood, Director of the Marine Biological Laboratory, Plymouth. In connection with revisal of proofs, I have been under many obligations to Mr. Charles M. Douglas, my Class Assistant in the University.

My original plan included a series of illustrations in Comparative Embryology. I accordingly applied to Mr. Murray, Publisher, for use of the two illustrations on p. 10 in Darwin's *Descent of Man*. In the kindest manner, and with the approval of Professor F. Darwin, these illustrations were placed in my hands, a generosity which I greatly valued. Ultimately, however, it proved impossible for me to carry out my purpose in complete form, and I was led to prefer reference to authorities generally accessible. I desire in this way to indicate my sense of obligation to Mr. Murray, for the readiness with which he responded to my request.

H. CALDERWOOD.

UNIVERSITY OF EDINBURGH,
4th January 1893.

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The outstanding problems concern the origin of things, the Cosmos as a whole, and the government of the Universe.—The light which Science throws on these.—Man's relation to the Cosmic System.—How far Speculative Thought and Religious Belief have been affected by advance of Science. —Increased sense of freedom from expansion of knowledge.—Closer relations with Nature.—No Finality visible.—Struggle continues the condition of progress.—Advancing Science unsettling Religious Belief.—Results proximate and remote.—Agnosticism, a spirit of scepticism.—It has a manifest sense of its own limitation.—It is only an assertion of the Relativity of Knowledge.—Hence Agnosticism is inconclusive and temporary.—It has been natural to man in all ages to recognise a Transcendent cause of Cosmic procedure.—The problems of Thought arise from the very conditions of Thought.—In Nature all movement is progressive. —Science is a continuous disclosure of Intelligent Purpose in Nature.—The popularity of Science is the death of Agnosticism.—Religious Faith and Feeling are in rational connection with advance of knowledge.—From the whole Cosmos comes evidence for an Intelligent First Cause.—From this Faith springs rational warrant for expectation of continuous advance in a Kingdom of Intelligence beyond the Present State, in harmony with the Moral Government manifest in the Cosmos, ... 294-311

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EVOLUTION AND MAN'S PLACE IN NATURE

CHAPTER I

EVOLUTION OF ORGANIC LIFE

For advance of scientific thought, there is still need for a fuller comprehension of man's place in Nature. The general acceptance of Darwin's theory of Evolution has opened the way for further investigation. Whatever differences of opinion as to this theory may still exist, few naturalists can feel reluctant to acquiesce in Wallace's statement that Darwin 'did his work so well that "descent with modification" is now universally accepted as the order of Nature in the organic world.' [1]

Acknowledging this, we need a much more searching study of man's place in relation to lower forms of life. The distinctive features of human life must be ascertained as far as present knowledge allows, for man is still a mystery to himself; and these must be interpreted in relation to the wide range of natural history. This task can be successfully accomplished only by regarding Nature as a whole,—a unity constituted by a most complex correlation of its parts. If man's place is to be thus studied, it must be with the patience which Darwin manifested in his observation of all lower forms of life.

We must contemplate man as he is related to the general scheme of 'Nature'—the system of things which we name

[1] *Darwinism*, by Alfred Russel Wallace, Pref. v.

'the Universe.' 'Nature' is often placed in contrast with 'Man,' and the two terms may be set in contrast; but more properly 'Nature' *includes* man and all his efforts. In developing our argument, we shall seek to incorporate the latest results of scientific research, as giving a solid basis for extended inquiry.

I am satisfied that no reasonably successful account of life in the universe can be presented which does not accept the general conclusion of Darwin, along with results of more recent research, at once sustaining and modifying his theoretic positions. It is no longer doubtful that a law of Evolution has had continual application in the world's history. How much is involved in this admission may still be matter for debate; nevertheless, it is generally agreed that a more accurate conception of the history of things has been obtained as the result of the researches in which Charles Darwin and Alfred Russel Wallace have led the way.

How the genesis of life is to be explained is still matter of conjecture alone. We must speak first of the *Origin* of life, after that of its *Evolution*. Evolution assumes existence. Thus evolution, in the history of organic life, presupposes organism. Darwin states his conclusion in these words: 'I cannot doubt that the theory of descent with modification embraces all the members of the same great class or kingdom. I believe that animals are descended from, at most, only four or five progenitors, and plants from an equal or lesser number. Analogy would lead me one step further, namely, to the belief that all animals and plants are descended from some one prototype. But analogy may be a deceitful guide.'[1] In every case a lower form existed prior to the higher. 'Evolution' is the origin of advanced forms, by the action of cosmic law upon the inherent energy, and inherited structure, of existing forms. 'Development' of individual life is not 'Evolution.' I give the definition in terms applicable to organism alone; everything bearing on the genesis of Mind being held in reserve.

Biological progress has its basis in the fact that Life, in each of its forms, moves towards the perfection of its kind. In 'natural history,' life is, therefore, taken as a reality present

[1] *Origin of Species*, p. 399.

at some early stage in the world's history. Evolution cannot be a complete natural history; at most, it is a scientific account of *later stages* in the history of life. The testimony of science is against spontaneous generation. Darwin saw this, and stated his position quite clearly. Thus, in the opening of his Chapter on Instinct, he says:—'I may here premise that I have nothing to do with the origin of the mental powers, any more than I have with *that of life itself*.' [1] Huxley puts very strongly the result of the evidence as against spontaneous generation. Nägeli, a high authority as to vegetable life, holds that of known living beings there are none which could have arisen by abiogenesis.[2] The presence of life thus supplies the basis of belief on which Darwin rests, when observation leads him to this declaration:—'I view all beings, not as special creations, but as the lineal descendants of some few beings which lived long before the first bed of the Cambrian system was deposited.' [3] But the lines of advance have been varied and manifold. 'Animals in general cannot be arranged in a series proceeding from less to more perfect in any way, so many, in different natural series, being on a par.' [4]

The fundamental position for zoology is that the *Origin* of life lies behind its *Evolution*. Of the *genesis* we have no scientific explanation. Questions of a speculative nature, springing out of this admission, must be left in abeyance for the present, being held in reserve for a later stage in this discussion.

Granting evolution of life on the earth, its progress has not been by a single grand movement, as when the tidal wave rises in the ocean. The law of evolution has had unceasing application, but it has worked out varied results. Environment having presented varying conditions, the consequence has been endless struggle, originating manifold diversity. 'Owing to this struggle, variations, however slight, and from whatever cause proceeding, if they be in any degree profitable to the individuals of a species, in their infinitely com-

[1] *Origin of Species*, p. 191.
[2] *Mechanisch-Physiologische Theorie der Abstammungslehre*, p. 83.
[3] *Origin of Species*, pop. ed., p. 402.
[4] *Life of Professor Owen*, i. p. 252.

plex relations to other organic beings, and to their physical conditions of life, will tend to the preservation of such individuals and will generally be inherited by the offspring.'[1] The laws providing for evolution have operated constantly, so that we should not seriously err if we depicted the history of life as a unity, representing a single world-wide progress. Though the struggle for existence has not been uniform, it has been continuous. The traces of its efficiency bring us to restricted areas of food-supply, or areas more or less crowded with competitors, having varying degrees of strength or of adaptation for securing all phases of desired gratification. This struggle does not disappear even when food is abundant; manifold preferences and desires claim gratification. It is, therefore, not merely under pressure of 'short supplies' that the weak are driven to the wall. World-history runs through a field of conflict, wide as the habitation of life, and varied as the inclinations of organism. But in the midst of all, and by means of the incessant struggle of the individual life, advance has been gained, making it reasonable to speak of 'survival of the fittest,' and of the advent of 'improved' species.

Human history is to be traced within this world-history. Humanity is not exempt from the conditions of progress which are really common to organic life. For man also, it has proved true that variety of surroundings, involving ceaseless but ever varying struggle, has secured a wealth of result in the history of the tribes and nations. We must, therefore, inquire more fully into man's relation with general cosmic laws, dealing, in course of the investigation, with the inquiry as to 'the probable genesis of Mind from non-mental antecedents.'[2] Darwin's observations bear mainly on animal life, and largely on the lower types of it.[3]

The complexity of life-history is such that exact con-

[1] Darwin's *Origin of Species*, p. 45.

[2] Romanes, *Animal Intelligence*, p. 3.

[3] Examination of the Index to Darwin's *Origin of Species* supplies evidence of this. In the Index of *The Descent of Man*, 'Intelligence' does not appear. Under 'Mind' we have only two references to comparative intelligence. I point to these features merely as they indicate the fields within which Darwin's observation was commonly concentrated.

clusions are unattainable as to the number of lines of advance, and the variations belonging to each. To gains must be added the risks of life, involving endless possibilities of deterioration. Mr. Herbert Spencer has properly emphasised the need for allowing weight to this last consideration: 'Organisms may vary not only in respect of their structures, but in respect of their tendencies to do this or the other, in all kinds of ways,—many or most of the ways at variance with welfare.'[1]

The evolution of life presents two marked phases. First, life finds in Environment provision for its continuance and growth, thus showing *dependence* on an inferior order of existence. Second, in unfolding, life shows power of adaptation to environment, thereby illustrating its *superiority*. The energy within life is the key to its progress. It is not in Environment, but in Life itself, that efficiency is found. Nevertheless, Environment necessitates conflict as a condition of life, out of which shall come general advance. There is, however, something startling in the vast *sacrifice* of life caused by these conditions. Whatever the moral difficulty here, specially as illustrated in human experience, of the evils of over-competition, there can be no doubt that a law of sacrifice is included among the conditions of progress. The general law is that individual effort is the initial condition for general advance. An inherent tendency to progress belongs to life in every form. This is the mainstay for our thought when seeking the interpretation of Nature. Growing understanding of an orderly universe promises ever-increasing reward.

As we contemplate lower organisms, it is apparent that 'warmth, air, light, moisture, food, are the mightiest impulses which determine the manifold variety of the forms of living beings.'[2]

The great lines of evidence for Evolution of organism are thus broadly marked. The laws of growth for individual life come first in importance; persistence of species bears

[1] Letter to Dr. Martineau: *Types of Ethical Theory*, 3rd ed., vol. ii. p. 570.

[2] Eimer's *Organic Evolution*, tr. Cunningham, p. 22.

its testimony for inheritance; modifications of species tell of the moulding influence of environment; the records of artificial selection, under the advantages of domestication, throw a broader light over the provisions of Nature, whether telling of abiding, or of temporary, deviations from the normal type. With aid of these facts, we see most vividly that progress is the law of Nature.

Darwin and Wallace, Weismann and Eimer are severed on points of large significance; but they are agreed as to the main laws of acquisition, and of inheritance, securing organic advance.

The testimony of *domestication* is here abundant and invaluable. The improvement of the breed of animals, such as the pigeon, the sheep, the dog, and the horse, under the care of man, reveals a wonderful advance. The value of artificial selection is that it shows the action of natural law accelerated, because aided by man's intervention. Human intelligence and purpose have been powerful factors in biological history. Through long ages, man has been a directing power in determining the history of animal life. Natural and artificial selection have worked *together*, producing the order of things with which we are familiar. The 'art' of man belongs to Nature. By appreciation of life's conditions, man is able to facilitate the action of natural law. Artificial selection is not *extra naturam*; it implies no cleavage in Nature; it only makes cosmic law more palpable.

Not easily do we obtain a full view of cosmic causes, and not readily do we yield to the demands of patient research. Darwin has done much to aid us in understanding the world's history, fulfilling Owen's anticipation of 'the discovery of the general secondary causes concerned in the production of organised beings.'[1] The gain to knowledge since Darwin's time has been immense. Division of labour among naturalists has concentrated attention on facts unexplained, and has deepened our conviction of the marvellous intricacy of Nature's methods. Only slowly do we learn how temporary uses are being served, while a general advance is

[1] Owen's *Life*, p. 249.

secured. 'As individuals grow, so the whole world of organic forms has grown up, from small beginnings.'[1] The complex system of law is even now working for still grander results, to be realised only in remote ages.

The conception of progress, which a theory of Evolution has thus made possible, still needs to be sustained by deeper research and to be expanded by fuller knowledge of the causes at work. We cannot escape from the need for guarding against hasty inferences, remembering that 'analogy may be a deceitful guide.'[2] Specially is there need, while accepting the theory of Evolution, for guarding against the fallacy of *the lower producing the higher*, forgetting how largely Nature, by the grandeur of the cosmic laws, has contributed to the character of the improved germ. While, therefore, imagination gathers aid from each unfolding life, it must figure things in harmony with a grander truth, recognising a greater potentiality operating before, above, and beyond the germinal forms from which new orders of life spring.

In 'Evolution' we have a working hypothesis of great value; but the further we advance in the work of interpretation, the more difficult does our task become. More particularly, Man's place presents a problem complicated beyond all other problems in Nature. External observation must here be supplemented by reference to experience, including all that Consciousness involves. The most advanced Experimental Psychology cannot obscure the fact, that beyond the measurements of nerve-action, there lie the problems of the nature and use of the scientific imagination, and of the reflective power, without which science cannot exist.

Historic questions are indeed secondary to the deeper problems of Psychology; but we cannot overlook historic evidence, while we are penetrating into the mysteries of Consciousness. Thus, the date of man's advent on the earth is a question of obvious importance. Testimony from fossiliferous strata supports the view that a much more remote date must be assigned to man's appearance on the earth, than

[1] See Eimer's *Organic Evolution.*

[2] *Origin of Species*, p. 399.

had previously been supposed to be warranted.[1] The first effects of change of view on this point were in an important sense revolutionary. But we must not lose sight of the corollary from the modern admission of man's antiquity, that we must assign to human *agency* a much larger place in natural history than science had previously acknowledged. Literary history dwindles in its proportions, supplying only a part of the evidence at command for deciphering the history of Man. The Earth's crust is the earliest chronicle of human action. We transcend the 'historic period,' tracing far beyond it evidence of the presence of Intelligence such as belongs to men now. The distinction between 'historic' and 'prehistoric' becomes relative only; much of history is independent of documentary evidence. Remains which can be inspected by any of us, carry our thought far into 'prehistoric' times. On long pages of 'unwritten history,' we find evidence for the existence of man; as, in our own times, on the lone moors of Scotland, patches of sward tell of the sites of former homesteads, the industry of departed generations. Within 'prehistoric' periods, time can be measured only by advance discovered amongst accumulated remains. A chipped flint for an arrow-head, or a polished stone for an axe, testifies to the presence of intelligence. Such evidence is as reliable as any we find in folk-lore, or in manuscripts,—often, indeed, more reliable.

To fix the date of man's appearance on the earth may not prove an easy thing; nor is it essential to our argument that we should be able to do so. We judge of epochs by signs of intellectual progress,[2] and of these signs by reference to records untarnished by possible bias. Some see in this large extension of human history, now commonly accepted, support for an evolution theory; but evidence as to contemporaneous life shows that the advent of human intelligence was long antecedent to the appearance of those of the higher mammals, the dog and horse, on whose services we most rely for evidence of animal intelligence. The argument for evolution of intelligence is, therefore, proportionally weakened. The antiquity of man presents a serious, it may be an insuperable,

[1] See Lyell's *Antiquity of Man*. [2] *Ibid.* pp. 7 and 228.

perplexity for a scheme of Evolution, if continuity of life be held to include intellectual, as well as organic, life. Still more striking is the result, when we connect the earliest and the latest epochs in human history. 'To sum up our knowledge of the ethnological past of man, so far as the light is bright, it shows him substantially as he is now; and when it grows dim, it permits us to see no sign that he was other than he is now.'[1]

Evidence for the advent of intelligence is gathered in the remains of skill and art, giving proof of man's presence on the Earth. Our museums, containing arrow-heads and axes from the Stone Age, supply unquestionable testimony to the antiquity of man. That this 'stone age' was intellectually less advanced than later ages must be implied in the conditions of human intelligence, and must be specially clear in this late era, celebrating the birth and growth of science. The tools of the early age are of primitive simplicity; but the evidence of intelligence like to our own is conclusive, in the form and polish of *stone* weapons. In the work of that remote age, we trace clearly the action of intellect, in comparison with which the intelligence of the higher mammals, *even of our own times*, is slight. From polished stone axes, to the improved tools of modern industry; from caves with rude frescoes, and the shell mounds close at hand, to our highly decorated dwellings, with their sanitary appliances; from the restricted language of an early age, to the literature and scientific investigation of the nineteenth century; we mark vast contrasts: but there is a continuity of intelligence consistent with known laws of intellectual progress. At the same time, let us recall how the art and literature of Greece and Rome were lost for centuries; and how in the Renaissance a fresh start was made in art, and how the treasures of Greek literature were searched for, that men of modern times might return on the philosophic problems of antiquity.

Even granting the 'animal intelligence' observed *now*, including progress under *domestication*, it must seem impossible to account thereby for human intelligence. With evidence for Organic Evolution, culminating in the human form, we cannot

[1] Huxley's *Man's Place in Nature*, p. 240.

trace a parallel unfolding of Intelligence in the world's history. Darwin, it is true, lends the weight of his name to the hypothesis we are here rejecting; but the structure of his argument does not induce confidence in his conclusion. He accumulates evidence of 'the descent of man from some lower *form*'; he deals with 'rudimentary *structures*, muscles, sense organs,' etc.; he claims that 'the laws of *variation* are the same in man as in the lower animals'; and thence he passes to a 'comparison of the mental powers of man and the lower animals,' claiming that there are mental features common to both. Even granting, as he contends, that 'certain instincts' are possessed in common, and also certain 'emotions,' we reject the conclusion of his carefully built-up argument, when he proceeds to 'a comparison of the mental powers of man and the lower animals.' Here we miss the clearness, the full store of facts, and the discrimination, with which we have grown familiar in his reasonings as to the relations of structure and its functions. Wallace's representation here seems fully warranted: 'Although perhaps nowhere distinctly formulated, his whole argument tends to the conclusion that man's entire nature and all his faculties, whether moral, intellectual, or spiritual, have been derived from their rudiments in the lower animals, in the same manner, and by the action of the same general laws, as his physical structure has been derived.'[1] On this view Wallace pronounces a judgment with which I fully concur: 'This conclusion appears to me not to be supported by adequate evidence, and to be directly opposed to many well-ascertained facts.'

In view of the wide difference between physical and psychical phenomena—between physiology and psychology, as sciences of human activity,—we cannot wonder that 'the great school of evolutionists is divided into two sects; according to the one, the mind of man has been slowly evolved from lower types of psychical existence; and, according to the other, the mind of man, not having been thus evolved, stands apart, *sui generis*, from all other types of such existence.'[2]

[1] Wallace's *Darwinism*, p. 461.
[2] Romanes, *Mental Evolution in Animals*, p. 9.

If Darwin's conclusion is to be upheld, it needs to be shown how a merely organic life, swayed by cosmic law, has produced Intelligence. When our rational life is patiently contemplated, the perplexities are so great, arising from the enormous distance which separates us from the highest animals, that an hypothesis of continuity is naturally met with incredulity. Yet it must be admitted that Darwin's conclusion is received with a large amount of scientific faith. We ought to know human life better than any other, and we really do; but then our own life is much harder to know, even with all the advantages of social relations constantly within view, and with immediate consciousness of all our own thoughts. What we do know, however, is so different from all that is seen in observing our 'mammalian congeners,' that the more common, and much the greater, difficulty for us, is to acknowledge our kinship with the animals. Even under the common conditions of organic existence, *our* whole experience is that of a rational life acting for itself; and this experience raises problems entirely new, involving innumerable difficulties for the evolutionist. It is easy to test the limits of our muscular energy; it is far from easy to measure the possibilities of our rational power. Comparatively few, indeed, deliberately face the deeper problems raised by the common features of our rational life. We know our powers, and we use them easily, without realising the conditions of their exercise. Even professional psychologists fight shy of 'metaphysical problems'; those thinkers who have most patiently studied the implications of rational experience have been the most ready to bear testimony to their intricacy, and the subtilty of the distinctions to be drawn for their interpretation. A search into the conditions of rational procedure, whether in the acquisition of knowledge, or in the regulation of conduct, is not reassuring for those who believe that investigations into nerve and brain will yield a science of human life. Even with the growing results of 'Experimental Psychology,' the dawn of thought in the world's history remains an unsolved problem.

By an exceedingly wide range of observations, the dependence of higher species on lower has been demonstrated.

The 'struggle for existence' has been made to stand out as a uniform feature in history. The stronger animal pushes aside or kills the weaker. The result, established on a wide induction, is the 'survival of the fittest,' giving at every advanced stage of biological history promise of fresh advance. Life is ever being tried and tested in order to secure development of latent power. Out of this comes the provision for evolution of new species. Not the death in the world, but the Life in it, thus becomes the object most conspicuous, showing the grand purpose served through all conflict. If animal life is being strangely sacrificed, it is in order that a stronger life may fill a larger place.

Beyond these general positions, we must seek interpretation of man's place in Nature. We have traced him to a remote age. Can we account for his appearance at that period by reference to the action of cosmic laws upon lower forms? We encounter here a perplexity which has not been experienced at any previous stage. The relation of thought to organic functions, and of the obligations of the moral law to the rising force of animal passion, have to be noted and their genesis explained. A large demand is thus presented. In presence of these contrasts, cosmic laws affecting animal life seem remote, and less capable of application. Doubtless, intervening between mere organism and human life, we have to make account of 'animal intelligence,' dim though its light be in comparison with the greater light shining in human consciousness. A closer relation is seen to exist between man and the higher mammals, a closer relation than holds in the case of lower orders, and this is best illustrated by co-operation with him in work. The power of Instinct, marvellous as it is, stands quite beneath the Intelligence which associates higher mammals with man. But the more deliberately we contemplate the conditions of human thought, even when it is applied merely for the guidance of animals in their work, the more clearly does it appear that the genesis of man is not to be scientifically explained by adherence to 'the purely zoological method.'

The world-wide influence of man is also to be considered, and the vast impression he has made on lower life and on

Nature as a whole. By man a potency has been long exercised having no analogy elsewhere. His power is altogether different from the great cosmic forces which have moulded organic structure for the accomplishment of new functions. In Humanity we deal with a life which is *sui generis*, largely controlling lower forms of animal life. Artificial selection, which Darwin found to be so helpful at the outset, supplies unexpected material for criticism of his own theory. The force of such criticism, he, in some degree, recognised. Thus he says, 'a new variety *raised by man* will be a more important and interesting subject for study than one more species added to the infinitude of already recorded species.'[1] This suggestion illustrates vividly the truth that man is a new factor, applying cosmic law in a manner unattained, or, at the utmost, very rarely attained, when biological results depended exclusively on natural selection. At this point, there opens to view a comparatively neglected region of inquiry as to the influence on animal life of the advance of human civilisation. Higher animal forms have been largely moulded by changes occurring in human requirements. Most animals have, no doubt, lived apart from such dominion; but the contrast in their history illustrates another truth, hardly less important for biological theory, that the greater the instinct the less the intelligence in animal life, for 'the fewness and the comparative simplicity of the instincts in the higher animals are remarkable in contrast with those of the lower animals.'[2] Hence Darwin concludes, and with obvious warrant, that 'the more complex instincts seem to have originated independently of intelligence.'[3] It must, in view of these facts, be of the utmost consequence 'to distinguish those parts of nature in which man plays the part of immediate cause, as something apart.'[4]

Even if we admit, with such reservation as the above considerations require, 'the overwhelming importance of natural selection over all other agencies in the production

[1] *Origin of Species*, p. 401. [2] *Descent of Man*, p. 67. [3] *Ibid.*

[4] Huxley, 'Struggle for Existence': *Nineteenth Century*, February 1888, pp. 165, 166.

of species' (Wallace), it is needful to emphasise the fact that we are dealing with the progress of organic existence under cosmic law, along with such additional results as follow on human intervention. Even after we have distinguished cosmic law on the one hand, from human devices on the other, there is need for remembering that 'the changes or motions in organic nature which result in an organism,' are 'not to be accounted for by forces which produce the motion, but by the cause or causes which *direct the operation* of the forces.'[1] We begin our inquiry with facts; we next search for the processes leading to their occurrence; but, we do not complete our inquiry, until we account for the origin of cell-movements, the true beginning of life's activity. Investigations as to minute structure must next be left behind, while we enter on a fuller study of human life, seeking the solution of the problem of man's appearance.

The oldest questions are still the newest, the questions concerning the life, the powers, the duties, and the destiny of Man. It is impossible that these problems should be of small significance in our day. Questions that have absorbed the interest of thinkers from the age of Socrates downwards cannot be treated as secondary. Inquiries which have been ceaselessly renewed throughout the history of men, must have permanent value for thought. Thus, the moral conviction and the religious sentiments, which have appeared in all divisions of the globe, and under all varieties of tribal and national organisation, must find their own place in natural history. Biology cannot at the same time include man, and exclude the characteristics of his life. Science, having achieved the extension of its boundaries, must make account of all that has been enclosed. A greatly extended task has, in our day, fallen to the hands of zoologists.

If Philosophy has often erred, as Spinoza truly maintained, by regarding man as *imperium in imperio*, there is, nevertheless, an actual *imperium*,—a true lordship of man in Nature. Neglecting this, Biology must expose itself to ridicule, as if Thought and the Thinker were of less moment

[1] Croll, *The Philosophical Basis of Evolution*, p. 7.

to it, than the habits of animals contending for a meal; or as if man were *suprema species* among the animals, and nothing more. Philosophy also needs warning against dealing with mere abstractions. For this Hegel resolutely and wisely pleaded. If this reform be achieved, we may accept it with reasonable gratitude to Biology for its aid. It devolves on the men of our day to show how all the sciences are to be harmonised in a manner equivalent with the unity found in Nature.

'Man is a being who doubly presupposes Nature, as he is a spirit which finds its organism in an animal body, and as it is in the system of Nature that he finds the presupposition and environment of his life.'[1] The philosophic spirit is thus in harmony with the modern inquiry concerning man's place in the cosmos. The outstanding problem can be solved only on condition of full appreciation of what man is; and for this there must be true insight into the life of consciousness. The work of Descartes, in disclosing the conditions of thought; still more, the critical philosophy of Kant, piercing into the essentials of rational life; the latest testimony of psycho-physics, showing how thought-movements and nerve-movements co-operate; and the best results reached by Darwin and his followers must be worked into harmony, in order to supply an approximately accurate interpretation of Nature.

[1] Edward Caird, *The Critical Philosophy of Immanuel Kant*, p. 10.

CHAPTER II

THE COMMON BASIS OF LIFE

THOUGH we cannot linger over the early stages of Biological investigation, we must carry with us at least a general conception of the latest scientific results as to the building up of organism, taking 'the physical basis of life,' as Huxley depicted it in his famous lecture on Protoplasm. We must see life springing up in the earth, and consider how inorganic material is transformed into vital tissue, by subtle procedure of Nature.[1]

Inclusion of vegetable with animal life is required, in order that living organism may be contemplated in all its aspects. The botanist, as Nägeli shows, has much to tell bearing on Evolution, as well as the specialists in biology such as Darwin and Wallace. In marking out the range of inquiry, Professor Burdon Sanderson has well said, we must begin with 'the elementary endowments of living matter, or living material,' taking even a single muscle in the body, or the microscopic hair of a plant. Here, we touch the beginnings of life-history. The more simple the structure contemplated, the more effectively will our purpose be served.

The first available hypothesis, that life originates under action of the mechanical and chemical forces operating throughout Nature, has been abandoned by almost all competent judges. The most careful search has failed to discover spontaneous generation. Nevertheless, as life in its earlier forms belongs to the material order, drawing its sustenance from the material universe, there does not seem to be any insuperable *logical* difficulty to bar the supposition

[1] See Mayer's *Die Organische Bewegung in ihren Zusammenhänge mit dem Stoffwechsel.*

that such life might originate under physical conditions. All that can be said with scientific authority is that Spontaneous Generation (*abiogenesis*;—*generatio spontanea*) has not been recognised as matter of observation, even after most painstaking search for it. There are, however, a few who cling still to the belief that mechanical and chemical forces may account for the origin of life. Nägeli favours this hypothesis; and it is more easy of acceptance to one studying life-history in the vegetable world, than it is to one devoted to animal biology. Though Nägeli favours a 'mechanico-physiological doctrine of descent,' he admits that among known living beings there are none which could have arisen by abiogenesis, for the lowest plants have a cell-membrane, and the *monera* [1] cannot live independently, *i.e.* without products from decomposition of other organisms.' [2] Huxley says:—'The fact is that at the present moment there is not a shadow of trustworthy direct evidence that abiogenesis does take place, or has taken place, within the historic period during which existence of life on the globe is recorded.' [3] All scientific testimony points to the conclusion that life comes only from life; that all life now appearing in Nature manifests its descent. The first appearance of life, therefore, involves a new start. We do not find any explanation of life by reference to 'a certain disposition of material molecules.' Nor are we helped by discovering that protoplasm—the physical basis of life—contains 'the four elements, carbon, hydrogen, oxygen, and nitrogen in very complex union,' even when gravitation and moisture and heat are regarded as aiding their action.

'The materialistic position, that there is nothing in the world but matter, force, and necessity, is as utterly void of justification as the most baseless theological dogmas.' [4] Yet life belongs to organism, its manifestation depending on chemical combinations and structural adaptations. Hence we naturally speak of 'living material' and of organic forms.

[1] The simplest of all organisms.
[2] *Mechanisch-Physiologische Theorie der Abstammungslehre*, 36 ff.
[3] 'Biology': *Encycl. Brit.*, 9th ed.
[4] Huxley's *Lay Sermons*, p. 158.

Science is, however, still unable to trace the process by which unorganised matter is lifted into vitalised organic form. So obviously is this one of the 'seven world-riddles,'[1] as Emil du Bois-Reymond has said, that we cannot contemplate the new appearance without admitting that we are face to face with one of Nature's mysteries. 'The spectacle afforded by the wonderful energies prisoned within the compass of the microscopic hair of a plant, which we commonly regard as a merely passive organism, is not easily forgotten by one who has watched its display continued hour after hour without pause or sign of weakening.'[2] Such energies produce the constant activity going on within the cells, whence all life-forms are developed. 'It appears to be a matter of no great moment what animal or what plant I lay under contribution for protoplasm, and the fact speaks volumes for the general identity of that substance in all living beings. I share this catholicity of assimilation with other animals, all of which, so far as we know, could thrive equally well on the protoplasm of any of their fellows, or of any plant; but here the assimilative powers of the animal world cease. A solution of smelling salts in water, with an infinitesimal proportion of some other saline matters, contains all the elementary bodies which enter into the composition of protoplasm, but . . . a hogshead of that fluid would not keep a hungry man from starving, nor would it save any animal whatever from a like fate.'[3]

Let us, however, suppose some startling advance in scientific knowledge, quite beyond present observations, carrying an explanation of the origin of life. Suppose a mechanico-chemical theory of its genesis thus obtained. Even then we should have under observation only the very lowest phase of life, a mere speck of living material, or, it may be, a mass of such material. Beyond this arises the stupendous conception of elaborating out of this mass the whole varieties of organism spread over the earth. This conception the theory of Evolution has supported. In our acceptance of the theory, we make a beginning in under-

[1] *Die Sieben Welträthsel*, 1880.

[2] Huxley's *Lay Sermons*, p. 137. [3] *Ibid.* p. 158.

standing the origin of species, seeing the development of tissue provided for by action of distinct cells.

Investigations, dating from A.D. 1830, have resulted in the recognition of 'protoplasm,' the simplest living material, as the common 'physical basis of life.' This soft, jelly-looking substance is not structurally of a simple character, as was at first supposed. It consists of two parts, viz., 'a minute network of very delicate fibrils, and an apparently homogeneous substance which occupies the interstices of the network.'[1] This is at the basis of all life. By reference to this, we are led to contemplate the vegetable and animal kingdoms as fundamentally one, for there is 'an essential correspondence between the elementary tissues of plants and animals.'[2] These two kingdoms, the one earlier, the other later, are the outcome of material energies working according to cosmic law. By microscopic examination of protoplasm, a promising beginning has been made for interpretation of biological history. This became apparent when Schwann's conclusion was generally accepted, 'that there is one universal principle of development for the elementary parts of organisms, however different, and this principle is the formation of cells.'[3] Thus, in reward of patient research, 'Nature is fast telling her long-kept secrets.'

A living cell is a nucleated mass of protoplasm, with or without a membrane for enclosure. It is not infrequently a closed vesicle, and may vary from $\frac{1}{100}$ to $\frac{1}{800}$ of an inch in diameter. Such cells constitute the basis from which organic life in the world is built up. These provide for the development of living beings, by formation of all the tissues within organism.

Each cell contains a nucleus, the life-propagating agency; and, within this, may be one or more of the nucleoli, which constitute minute vital centres. Living material, even in its primary simplicity, is strikingly complex. This cell, with its

[1] *The Cell Theory, Past and Present*: Inaugural address to the Scottish Microscopical Society, by Professor Sir William Turner, D.C.L., President, 1880, p. 27.

[2] *Ibid.* p. 11.

[3] *Microskopische Untersuchungen*, 1839.

living centre, is the simplest phase of individuality in Nature. Each cell is in itself a living being, with an energy altogether marvellous. With discovery of the cell as the basis of vital function, 'the mystery which before belonged to the organism was transferred to the unit, which, while it served to explain everything, was itself unexplained.'[1] We do not any longer think merely of each animal form as a centre of life, but of each cell within its body as an active individual, contributing its share to healthy development of the organism. Of this discovery Professor Burdon Sanderson has said that it 'seemed to be a very close approach to the mechanism of life; but now we are striving to get still closer, with the same result. Our measurements are more exact, our methods finer; but these very methods bring us to close quarters with phenomena which, though within reach of exact investigation, are, as regards their essence, involved in a mystery which is more profound the more it is brought into contrast with the exact knowledge we possess of surrounding conditions.'[2] The unexplained marvel is the energy lodged in the cell, which expands and forms a new cell. This process of self-propagation supplies the key to all development of organic life. All that can as yet be said is, that 'living material acts by virtue of its structure'; and the cell is the individual form possessing the great power at work. Our knowledge of vital procedure depends on observation of the activity of the cell. The utmost efforts of science are limited to this. Professor Burdon Sanderson has said, if we are not to fall back on that worn-out *deus ex machina*, protoplasm,' we 'must use analysis of function as the guide to the ultra-microscopical analysis of structure.'

Life as represented in the cell is propagated by division of the cell, originating a second cell. Beale's observations[3] are thus briefly described by Sir W. Turner:—'The elementary tissues of every living thing consists of matter in two states, the one an active, living, growing substance, composed

[1] 'Mechanism of Life in its Simplest Aspects,' by Professor Burdon Sanderson: *Nature*, vol. xl. p. 525, 1889.

[2] *Ibid.* p. 525.

[3] Beale's *Structure of the Simple Tissues*, 1861; *Bioplasm*, 1872.

of spherical particles, capable of multiplying itself.' The other 'is situated peripherally to the germinal matter from which it is produced; it is passive, non-living, or dead, incapable of multiplying itself.'[1] The former, Beale names 'bioplasm'; the latter, 'formed material.' Beale states that in some cases the germinal matter corresponds to the 'nucleus,' in others to 'the nucleus and cell contents,' so that the wall or membrane enclosing the cell is the only non-germinal portion. Strasburger and Flemming discovered 'that the nucleus in its passive or resting stage, consists, in addition to the nucleolus, of threads or fibres, some finer, others coarser, formed of nuclein, and arranged in a reticular net-work, so as to form little knots at the points of intersection of the fibres.'[2] These nuclear fibres play an important part in the process of cell-multiplication. During the movement which results in the formation of new cells, the fibres arrange themselves in loops, and form a spindle-like figure. Each loop-fibre splits up into two threads. These threads separate and pass to opposite poles of the spindle, and form the nuclei of two new cells, formed by severance of the poles. This brief summary represents in outline the results of the closest observation of procedure in Nature's laboratory. 'Young cells arise from a parent cell by division of the nucleus, followed by cleavage of the cell-protoplasm, so that each cell is directly descended from a pre-existing cell.'[3] Germinal matter is 'matter in a state of activity, or capable of assuming this condition, possessing inherent powers of selecting certain inanimate substances, and of communicating its properties to these, which exists in all living beings, and from it every tissue is produced.'[4]

Microscopic cells, such as those described, contain the living principle in the vegetable and animal tissues. In the order of Nature, the vegetable kingdom is that which produces protoplasm. 'Notwithstanding all the fundamental resemblances which exist between the powers of protoplasm in plants and in animals, they present a striking difference

[1] Turner, *The Cell Theory*, pp. 26, 27. [2] *Ibid.* p. 28. [3] *Ibid.* p. 35.
[4] Beale, *Structure of the Simple Tissues of the Human Body*, p. 24.

in the fact that plants can manufacture fresh protoplasm out of mineral compounds, whereas animals are obliged to procure it ready-made, and hence in the long-run depend upon plants.'[1]

When we contemplate the various animal forms, we naturally think of the animal itself as the individual. But it is in reality the individual *cells* within, which build up the tissues, and even the several organs of the body. The animal, impelled by appetite, appropriates the material which goes to sustain its energy, but the several groups of cells within do the work of recuperation, when animal impulse is satisfied, and organic functions provide for assimilation of nutriment.

Not in animal life any more than in vegetable, is there anywhere appreciation of the method of development. Only where mind appears is there regard to the relation of means to ends, recognition of this relation being extra, or *external*, to the sensitive organism.

Microscopic observation of the activity of the cell presents facts of great significance, as bearing on our general inquiry. All cell-activity illustrates selective power and purposive work, both phases of activity being explained by 'ordinary physical means,' apart from intelligence. In their ordinary activity, the cells discover and appropriate the material supplied for their growth, 'possessing inherent powers of selecting certain inanimate substances,'[2] in order to work out an increase of life. Besides, cells themselves become *modified* for the performance of distinct functions, so providing for the first stages of differentiation in the history of organism. From a common basis in the ordinary cell, there emerge cells adapted to supply nerve-energy, to secrete bile, to form muscular tissue. In every organism there are groups of cells to which distinctive functions belong.

To illustrate the selective and purposive action of the living cell, a few examples may be given. Lining the canals of a sponge, there are ciliated cells. The hair-like cilia projecting into the canal, constantly wave in one direction,

[1] Huxley's *Lay Sermons*, p. 138. [2] Beale, *Structure of Tissues*, p. 24.

causing a current of water to flow, bearing minute food-particles which the cells absorb.

Again, take the cells (*nematocysts*) covering the stinging surfaces of the higher medusæ. These contain barbed threads, weapons of attack, which cause the well-known irritation, like the stinging of a nettle.[1] Again, take the white corpuscles of the blood (*leucocytes*). 'It has been shown quite recently that if micro-organisms, which are themselves the sources of disease to the animal they invade, enter the system, the leucocytes go towards the micro-organism, and apparently seek to destroy it.'[2]

Once more, take the germ-cell or egg, which constitutes the first stage of embryonic existence for an animal. This germ-cell requires distinction of sex for the reproduction of species. Each type of higher animal life springs from a fertilised egg, the ovum being fertilised by addition of the spermatozoon, which penetrates the ovum, starting a new phase of activity, so generating a new life of the species to which the ovum and sperm belong. This is the beginning of that mixture of elements which provides for variation under laws of heredity. In every such egg there is nutritive material, and a nucleus which is the centre of reproductive activity. Thus, when differentiation of sex has appeared, each parent contributes distinctively to the new life encompassed within the egg. The earlier stages of development belong to the embryonic period; but from first to last in the history of life, cells which multiply by their own inherent energy, build up the tissues and spread out, to differentiate the several functions of the organism. Within this field of microscopic observation there is a striking confirmation of the theory of Evolution. In course of organic advance, 'when new characters become persistent in a group of individuals,' and there is 'loss of the intermediate forms, then we speak of a new species.'[3]

It is thus in the activity belonging to cell life that we discover the primary conditions of organic structure and functions. The cell, in exercise of its energy, appropriates

[1] Horsley, *Structure and Functions of the Nerve System*, p. 30. [2] *Ibid.*

[3] *Organic Evolution*, Eimer, Cunningham's translation, p. 23.

nourishing material, transforming it into its own substance. Vital energy thus stands in contrast with physical energy, such as the measurable force of running water, or the explosive power of powder. The action of the cell is the *type* of all organic action. Such vital action is a transforming power, quite apart from mind. Vital energy ever fulfils a discriminative function in course of a purposive action, transforming inanimate matter into living organic form. But in this activity there is no understanding power, providing for increase of knowledge; there is selective power, without intelligence; purposive action, without volition. From the selective and purposive functions of the living cell come expansion of life, formation of organs, differentiation of sensory and motor appliances. By it, all forms of organism, including human organism, are evolved. How all this bears on the general inquiry with which we are specially concerned, may be learned from a competent scientific witness:—'There is little ground for the apprehension that exists in the minds of some, that the habit of scrutinising the mechanism of life tends to make men regard what can be so learned as the only kind of knowledge. The tendency is now certainly rather in the other direction. What we have to guard against is the mixing of two methods, and, so far as we are concerned, the intrusion into our subject of philosophic speculation. Let us willingly, and with our hearts, do homage to "divine philosophy," but let that homage be rendered outside the limits of our own science. Let those who are so inclined cross the frontier, and philosophise; but to me it appears to be more conducive to progress that we should do our best to furnish profound philosophers with such facts relating to structure and function, as may serve them as aids in the investigation of those deeper problems which concern man's relations to the past, the present, and the unknown future.'[1]

[1] Professor Burdon Sanderson, *Nature*, vol. xl. p. 525.

CHAPTER III

THE RELATIONS OF ENVIRONMENT TO LIFE

ORGANIC life is insufficient to work out a history for itself. Dependence on Environment constitutes an essential feature in any theory of comparative zoology. Yet the energy belonging even to the minutest form of life is marvellous. Such organism is capable of seeking successfully the nutriment requisite for its support, the forces of Nature being ever at work producing fresh supplies for all forms of life.

All organism must have, besides nutriment, space for movement, and conditions of satisfaction. Without these, life must disappear. But there are varying degrees of dependence. In the history of vegetable life, it is at its maximum, needful supplies being drawn from a comparatively limited area. Animal life, moving over a considerable space, competes for existing supplies, having its work prescribed by pressure of physical wants. In remote depths of the forest, rarely resounding to the footsteps of men, and in the great wilderness, this pressure is felt. The common conditions of life require unceasing toil to provide for life's wants, and to ward off life's dangers. Not always by co-operation are supplies found; more commonly there is individual struggle for ascendency over others of the same species, or destruction of lower species. It is with most animals, as with the fishes in a stream, the largest are in advance taking the food most attractive, the others have what is left. Search, struggle, and consequently the 'survival of the fittest,' are characteristic of animal life. Supply is limited; craving of appetite rules; and, unwittingly to the animals, advance in organic life results, in the history of all species. As an example of rarer kind, I take Owen's *Memoir on the Aye-Aye*, an animal belonging

to Madagascar, and feeding on the wood-boring larvæ. This animal sleeps during the day, and moves about at night in quest of larvæ. How well the structure of the organism is adapted for the work to be done will appear from Owen's description:—'The wide openings of the eyelids, the large cornea, the expansile iris, with other structures of the eye, admit of utmost absorbing of the light at night.' The animal has 'large ears, and large acoustic nerve, to hear the vibrations of the boring insects.' 'The front teeth, by their great size, strong shape, chisel structure, deep implantation, and provision for perpetual renovation of substance, are specially fitted to enable their possessor to gnaw down with gouge-like scoops.' The insect for which he searches can withdraw into the ramifications of its tunnel, requiring the Aye-Aye to dig swiftly and powerfully into the tree. Accordingly the hand is modified in a singular and anomalous way. 'One finger on each hand has been ordained to grow in length but not in thickness with the other digits: it remains slender as a probe, and is provided at the end with a hook-like claw.' By this the grub is seized and drawn out. For this effort, the animal requires free use of its fore-limbs, while the hind limbs keep fast hold on the tree. To give the animal the requisite grasp, 'one of the digits of the hind foot is so modified and directed that it can be applied thumb-wise to the other toes, and the foot is made a prehensile hand.'[1]

In this case, we have an epitome of results, showing the influence of environment on the adaptive power of organism. It is an illustration all the more striking that the animal is not familiar, and lives remote from observation. The slow modifications consequent on continuous action under fixed conditions are here seen in the characteristic structure of an extinct species. We thus observe how use leads to differentiation of organic forms, as disuse leads to differentiation in structure.

Human life is not severed from the action of the ordinary laws of physical life; environment and occupation leave their impress on the human frame also. But man is superior to circumstances, as no other being can be. The laws of Nature

[1] *Life of Professor Owen*, vol. ii. p. 137.

are interpreted and applied by him so as to modify the conditions of life. Thus Nature's supplies steadily grow to meet advancing demands, even while limits of production are clearly within sight. Supply is no longer restricted to what an urgent appetite finds ready to hand; but is prepared for, produced, and gathered in. Man toils, and waits, and is rewarded with his harvest. Soil and seeds, implements of handicraft and machinery for working up raw material, are forms in which, by anticipation, we express food and clothing. The most dependent organism, linked with a rational life, becomes in history the least dependent. The highest life meets life's demands by forethought and skilled effort. A new aspect is thus given to natural history, greatly modifying 'the struggle for existence.'

The appearance of rational life on the earth has told largely on many of the lower forms of life. Human life, all over the world, maintains a commanding position. As man's influence extends, the struggle for existence meets a check, and development of life takes new directions, under a guiding power which is the main factor in determining results. In this way we have at command all the evidence which *artificial selection* supplies for 'descent with modification.' Man largely modifies, and even makes, environment for himself, and for other species as well; and this not merely by individual effort affecting a single species, but by industrial enterprise, and by organisation of civil government, for these advance together, affecting the history of the whole animate creation.

In all this, however, life itself is the moving power, while environment fixes the conditions which vital movement encounters, and to which it must adapt itself. Neither does life account for environment, nor environment account for life. In recording our observations of this relation, we speak of the 'action' of environment as we do of the action of life; but in these two cases 'action' is used in quite different senses. Life is greater than its surroundings, however dependent upon them. 'Nature,' as distinct from life, is a wilderness; a mere basis for vital existence. Environment has its value in its relation to life, for all true action is life-

action. But, from the first movement of life, there appears in the world's history *interaction* of external stimulus, with effective response. Our definition of 'environment' is, however, constantly shifting, for as we rise in the scale of life, environment includes even lower forms of life, on which higher forms feed. That a certain mastery belongs to environment, even human history is ever testifying; but this mastery yields before the powers of the rational agent. By interpretation of Nature's laws, man makes a new use of Nature's supplies, extending his hold on natural possessions, so multiplying comforts and advantages.

Under a wide induction, the development of life appears as the grand end; a vast amount of life on the earth disappears as a means to this end; only when rational life occupies a governing place can we speak of life which is 'an end in itself,' never to be used as a means to an end—not even under an ethical law of 'self-sacrifice.' The lower the life is in the scale of being, the greater the sacrifice of it. The law of the *preservation of life* comes into view only when the rational being appears. Then, for the first time, life has an ethical basis. Such a life, even while involved in 'the struggle for existence,' knows that the highest laws of its being require restraint on conflict. Huxley has stated the case with clearness and force: 'There is a fallacy which appears to me to pervade the so-called "ethics of evolution." It is the notion that because, on the whole, animals and plants have advanced in perfection of organisation by means of the struggle for existence and the consequent "survival of the fittest," therefore men in society, men as ethical beings, must look towards the same process to help them towards perfection. I suspect that this fallacy has arisen out of the unfortunate ambiguity of the phrase "survival of the fittest." "Fittest" has a connotation of "best"; and about best there hangs a moral flavour. In cosmic nature, however, what is "fittest" depends on the conditions.' But the social life of man presents a new phase of law. 'Social progress means a checking of the cosmic process at every step and the substitution for it of another, which may be called the ethical process; the end of which is not the survival of those who

may happen to be the fittest, in respect of the whole of the conditions which exist, but of those who are ethically the best. . . . Its influence is directed, not so much to the survival of the fittest, as to the fitting of as many as possible to survive. It repudiates the gladiatorial theory of existence.'[1]

The law of the preservation of life here places a check on the struggle which animal passion maintains. 'The sacredness of human life' is the declaration that human life is *sui generis*,—apart from all life besides,—so that the conditions of its activity cannot be interpreted merely under the laws applicable to organic life. Thus within the sweep of cosmic law, in its widest sense, we trace three phases in the history of life,—life surrendered for the sake of a higher; life maintained by destruction of other forms; and life subject to rational law, and thereby restrained and guided, as no other life is. It is the peculiarity of human life, by reason of association of physical and ethical life, that in certain important respects it participates in all three phases.

When attention is concentrated on the continual destruction of the lower forms of life, the law of Evolution, as seen in application, leads to a deeper knowledge of the possibilities of organic development, and of the history of biological advance. The harvest of life becomes manifest, as the result of a wider range of vision. 'Struggle for existence' was by long ages antecedent to man's appearance, when harvest succeeded harvest in remote times. Silent ages have been fruitful in ever-increasing measure, before the epoch of man's advent. Ever as the noise of his work has become louder, the impress of it has become more marked, bringing all life besides into subjection. Variations of environment detect the potency of organism. Its power of adaptation to external demands becomes increasingly surprising, as the researches of natural history are continued. Life, long since vanished from its place in the earth, has left its impressive testimony behind. We can read it in later forms, as plainly as we read testimony on the printed page. The witness of biological evolution is ever coming out more clearly to view, as we see

[1] Huxley, *Evolution and Ethics*: Romanes Lecture, 1893, pp. 32, 33.

present forms in relation with the background Nature supplies. As action and reaction advance, a higher life appears; much of inferior structure disappears, while larger variety is introduced.

All the interest of romance belongs to those silent processes, which are being slowly traced, as we find it possible to connect things past and present by reference to the structure, form, and even colour, of living beings. Special lines of scientific observation have thrown a strong light on sections of biological history, otherwise quite perplexing. Oftentimes such observations are more interesting, as well as more widely suggestive, when concerned with lower forms. For an example, the observations of Agassiz on 'the young stage of osseous fishes' may be selected. These observations include changes in the structure of flat fishes, changes in the tail, in development of pigment-cells, and transposition of an eye from one side of the head to the other. These are incidents in the adaptation of the young of flat fishes to the modes of life peculiar to the species at a later stage. Change of situation of the eye strikingly illustrates the power of adaptation even in comparatively low orders of life. Young flounders first swim vertically, as most fishes do, and only after a time, they turn over on their side. 'While still in the egg, and for some time after hatching, the eyes of the two sides are placed symmetrically on each side of the longitudinal axis.' The change of position of one of the eyes, so as to place both on what is to be the upper side, is effected 'very early in life,' while all the facial bones of the skull are still cartilaginous. The first change of position of the eye to be transferred is its slight advance towards the snout; this is soon followed by 'a slight movement of rotation.' When the young fish is seen in profile, 'the eye on the blind side is now slightly above and in advance of that on the coloured side. With increasing age, the eye on the blind side rises higher and higher towards the median longitudinal line of the head, a larger and larger part of the eye becoming visible from the coloured side, when the embryo is seen in profile, until the eye of the blind side has, for all practical purposes, passed over to the coloured side.' After this change has occurred,

the dorsal fin 'extends along the head towards the nostrils,' 'thus finding its way behind the eye which has come from the blind side,' as if preventing return of the eye to the normal position.[1] These evidences of adaptation are the more valuable that they are quite apart from modifications obviously in the line of evolution.

Although the flat fish occupies a quite subordinate place in Nature, the history of the change of position of the eye presents a very striking example of adaptation to the conditions under which food-supply is to be obtained. Testimony to the power of living organism to effect changes, possible only on condition of selective and purposive action, has additional value coming from a type of life to which we do not attribute 'animal intelligence.' Such an illustration as this stands very vividly over against conscious discrimination of qualities and relations, and adaptation of means to ends, familiar to our intelligence.

Granting Darwin's induction that 'a struggle for existence inevitably follows from the high rate at which all organic beings tend to increase,'[2] allowance must be made for wider modification of organism than this law implies. As Darwin admits, the phrase 'struggle for existence' must be used in 'a large and metaphorical sense'; and so must 'environment' be read much more largely than could be suggested by mere dependence of numbers on possible satisfaction for animal wants.

When at length the distinction between animal life and rational comes to be considered, the difference in relation to environment becomes very marked. Dependence continues for the highest life, as for lower forms, but it differs greatly in degree and manifestation. Animals are mastered by

[1] The record of these observations by Agassiz will be found in a series of three papers, published in the *Proceedings of the American Academy of Arts and Sciences*, the first in 1877, the last in 1882. The observations on the transference of the eye are given in the second paper, published June 1878, in volume xiii. of the *Proceedings*. On this subject, see also Wallace's *Darwinism*, p. 129. My son, Mr. W. L. Calderwood, when acting as Director of the Marine Biological Laboratory, Plymouth, gave me the opportunity of observing specimens at several stages of development.

[2] *Origin of Species*, p. 46.

environment; we exercise a mastery over it, impossible in the history of lower life. Environment is at first Nature's gift; afterwards, it is what man has made it, by rational appreciation of Nature's laws, so producing higher results. Civilisation reacts on the world itself. The daring and endurance of the explorer; the best results of mechanical contrivance; the rivalries of civilised nations; all that is best in generous feeling and purpose among the nations, are all of them tributary to progress, though its course be clouded by ceaseless struggle, untold suffering, manifold wrongs!

'Struggle for existence' has its separate meaning for each type of life. Each living creature must seek supply for its own wants; failing, must languish and die; succeeding, must advance, and contribute also to general advance. Natural selection 'is the only means at present within reach of reducing the chaos of observed facts to order'; and 'it is the most powerful instrument of investigation which has been presented to the naturalist since the invention of the natural system of classification, and the commencement of the systematic study of embryology.' [1]

While this is clear, there is a marked contrast between 'Nature' in its lower sense and in its higher;—between 'natural selection' and 'Nature's' higher work, when rational power is moving on the face of the earth. Rational life makes a new epoch in the history of environment. Progress has a new history in presence of this new agency, disclosing a potentiality previously inoperative. All 'Nature' becomes a larger thing, when 'Nature' includes humanity. For long ages, this greater amplitude of being has subsisted; but even now we have penetrated only a little way into the secrets of Nature, finding, at every step in advance, secrets lying deeper still, baffling the efforts of the most patient observers.

[1] Huxley, *Man's Place in Nature.*

CHAPTER IV

HEREDITY AND EVOLUTION

THE *persistence* of species is matter of common observation. Hence the novelty of the thesis which Darwin announced, and the difficulty of giving credence to his theory, as if *variation* of species were quite as much a feature in Nature as their persistence. When, however, Darwin stated his contention in these terms, 'that species are not immutable,' it became apparent that denial of the persistence of species was not involved. Darwin viewed organic life on a large scale, contemplating mainly 'the affinities which connect together whole groups of organisms.' He said, 'I had never deliberately applied these views to a species taken singly'; [1] but he made it his chief matter of congratulation that he had shaken the belief in the separate creation of species.

Laws of inheritance are conspicuous in the order of Nature. Spencer has shown that these laws are closely related with variation.[2] For biological advance, acquisitions must become permanent possessions in the history of life. Without *a law of inheritance*, structural gain would have been restricted to the individual. Each life would have been doomed to struggle, as if nothing had been achieved by progenitors. Dependence on ancestors must imply gain to offspring from ancestral acquisitions. 'Descent with modifications' is thus a prominent feature in Darwin's theory, which depends on evidence adduced for transmission of organic adaptations and acquired aptitudes. This evidence is so abundant and varied, as to leave no longer any uncertainty around the conclusion that a steady advance in organic form and function has been achieved in our world's history.

[1] *Descent of Man*, p. 2.

[2] Herbert Spencer's *Principles of Biology*, i. p. 256.

While, however, variations are possible, sudden changes in the structure of organism do not appear. 'Natural selection acts only by the accumulation of slight modifications, . . . each profitable to the individual under its conditions of life.'[1] The work of the naturalist is, on the one hand, to trace 'the long and graduated succession' of modifications; on the other, to discover the laws of heredity in accordance with which slight modifications may be transmitted. Variation and transmission are connected in the same movement. Modified structure 'will impress some corresponding modification on the structures and polarities of its units.'[2] 'The units and the aggregates must act and react on each other.'[3]

A breadth of fresh light has been thrown over the difficult problem of heredity, by research into the minute variations appearing in the history, not only of species, but of families belonging to the same species. It has proved possible to mark the rise of slight variations, and to trace their continuance in the life of progeny. That there are fixed laws of inheritance has thus become matter of certainty. Favourable variations in structure are shown to tell upon the history of reproduction. But a theory of heredity proves as difficult to make out as a theory of acquisition. Indeed, the difficulty as to heredity seems even the greater. The action of environment lies open to observation, whereas the laws of heredity still belong to Nature's secrets. We must, therefore, turn to the phenomena of reproduction, as these may show, in the inherited structure, visible tokens of parentage.

The physical basis of inheritance is traced first in the cell-life,—in the 'physiological unit'; next in the germ-plasm, or germ-cells. In more advanced organic forms there is the blending of male and female elements, after which the fertilised ovum passes through the several stages of embryonic life. The potentiality of the fertilised ovum is at length disclosed in the individuality of the newly-born life.

As a manifestation of latent potentiality, there is nothing more marvellous in Nature than the germ out of which an elaborate organism is unfolded. An exceedingly minute

[1] Darwin, *Origin of Species*, p. 211.

[2] Spencer's *Principles of Biology*, i. p. 256.

[3] *Ibid.*

nucleus is the starting-point for the most complex organism, whether it be that of the dog, of the horse, of the ape, or of man. 'Vital organisation is Nature's masterpiece, summing up in itself all her other processes.'[1] Every physiologist grants that 'the fertilised egg is one of the greatest wonders within our knowledge.'[2] Russel Wallace has well said: 'No thoughtful person can contemplate without amazement the phenomena presented by the development of animals. We see the most diverse forms—a mollusc, a frog, and a mammal —arising from apparently identical primitive cells, and progressing for a time by very similar initial changes, but thereafter each pursuing its highly complex and often circuitous course of development, with unerring certainty, by means of laws and forces of which we are totally ignorant.'

The minuteness of the germ is the first ground of astonishment, the complexity of the developed organism is the next. Their relation constitutes one of Nature's great marvels. 'The size of the particles which are derived from the parents, called the male and female pronuclei, the potentiality of which is so utterly out of proportion to their bulk, is almost inconceivably small when compared with the magnitude of the adult body.'[3] This minute fertilised ovum, apparently a simple sphere with a pin-point centre as the nucleus of life, has within it provision for unfolding all the features common to its species. The complex organism of the dog, the horse, or the ape is lying in germ within the ovum from which the life-development takes its rise. 'The ovum, in its young condition, is obviously nothing but a simple cell.'[4] Thus, 'it is in no way necessary that a germ should have the character of a miniature.'[5] The marvel is further extended, when it is added that, during the fœtal life, the early stages of development appear in forms so analogous, that it proves for a long time impossible to distinguish the species, so like are the

[1] *Process of Human Experience*, by W. Cyples, p. 497.

[2] *The Law of Heredity*, by W. K. Brooks, Baltimore, p. 312.

[3] Sir W. Turner's Address to British Association, 1889: *Nature*, vol. xl. p. 526.

[4] *Comparative Embryology*, by F. M. Balfour, vol. i. p. 19.

[5] Cyples's *Human Experience*, p. 490.

primary forms of the embryonic life of a child to those of young animals.[1]

Turning to cell-life within the mature organism, it is found that only a limited number of the great variety of cells within a fully-developed body are reproductive cells. These last constitute a distinct order, each cell having its own individual life, dependent, however, for its continued vitality on its place in the parent life, and liable to modification according to changes in that life. Reproduction depends on the union of male and female pronuclei of allied species. These in vital combination start a new life-history. That the nucleus of the male cell (spermatozoon) penetrates to the nucleus of the female cell (ovum) has been ascertained. But observation has not yet supplied data as to distinctive hereditary potency coming from each parent. With an organism so minute, it is difficult to secure completed observations. But the facts of after-life clearly show hereditary influence from both parents.

During development of the individual life, the characteristics of the species appear. This is the general result illustrating heredity. 'Like produces like.' Though the fertilised ova of different species pass through transformations startlingly analogous, the distinguishing features of the species to which each belongs are *invariably* presented, as embryonic development gives place to adult form. Whatever argument for continuity may be drawn from homologous embryonic structure and function, there lies alongside, equally clear and constant, evidence for the persistence of distinct species. Organism continues its own history through its reproductive process.

In advance of this, we desire, if it be possible, to trace relative stages of progress, indicating how *variation* in the mature life becomes established as an inheritance.[2] Artificial fertilisation, in combination with ordinary phenomena of embryology, has helped; but conjecture and speculation still enter considerably into this whole discussion.

Science is now deeply concerned with an answer to this question,—How do the laws of heredity provide for trans-

[1] See Huxley, *Man's Place in Nature*, p. 67.

[2] See J. Arthur Thomson's *Theory of Heredity*, Trans. R.S.E., xvi. 91.

mission of acquired characters, 'profitable to the individual under its conditions of life'? While 'like produces like,' how does the likeness pass beyond the characteristics of the species, so as to include even the minuter features of family life? 'The problem for consideration is the mode in which these germ or reproductive cells become influenced, so that after being isolated from the cells which make the bulk of the body of the parent, they can transmit to the offspring the characters of the parent organism.'[1]

In the life of the simple cell, we know that reproduction is the result of a splitting into two of the nucleus and the surrounding protoplasm, or the splitting of several young cells from a single parent cell. When, in course of biological advance, diversity of sex has appeared, making amphimixis the condition of progeny, it seems clear that 'the germ-cells, after their isolation, take no part in the growth of the organism in which they arise, and their chief association with the other cells of the body is that certain of the latter are of service in their nutrition.'[2] Germ-cells are thus distinct centres of life, whose specific function is reproduction of the species. The activity of these germ-cells is largely affected by the vitality and functional activity of the mature body in which they have their sphere of existence. By means of difference of sex, there is the blending of two elements—*amphimixis*—in a new life. 'The act of impregnation may be described as the fusion of the ovum and spermatozoon; the most important feature in this act appears to be the fusion of a male and female nucleus.'[3] Forthwith these combined elements work in unison, involving provision for double agency in the line of heredity. The life may be that of the larva, encompassed in food-yolk, or that of the embryo nourished in the womb. Ordinary observation of the higher organisms shows in the offspring characteristics of both parents.

Here, then, are data presenting a problem of great perplexity. 'A single cell, out of the millions of diversely differentiated cells which compose the body, becomes

[1] Sir W. Turner's Address: *Nature*, vol. xl. p. 527. [2] *Ibid.* p. 527.

[3] *Comparative Embryology*, by F. M. Balfour, i. p. 69.

specialised as a sexual cell; it is thrown off from the organism, and is capable of producing all the peculiarities of the parent body, in the new individual which springs from it.'[1]

In the history of the greater number of the forms of life, reproduction is by the combination of *two* cells, each coming from a mature organism, the one male, the other female. 'Fertilisation of the ovum,' being the accepted phrase descriptive of the reproductive process, seems to suggest that a single cell is operated upon by external agency. But what really occurs is the *fusion* of two cells, constituting a new life. There is thus 'the fusion of two hereditary tendencies.' Two cells, each having a quite distinct life, have passed away from their primary position, and these *two* cells now constitute *one cell*, in which a new life has found its origin within the uterus, where its earlier stages of development occur.

Beyond this initial period, the perplexities encountered by scientific research are specially great, on account of the minuteness of the germ in which life originates, and the delicacy of the slender nuclear fibres in which movement first appears. There can be little wonder that Weismann should say that, 'No one of the many attempts to solve the problem . . . can be regarded as even the beginning of a solution.'[2] Yet Weismann, with singularly free use of hypothesis, goes on to say that,—'In the higher organisms, the smallest structural details, and the most minute peculiarities of bodily and *mental* disposition are transmitted from one generation to another.' Thus in a quite uncritical spirit, it seems to be assumed that the manifestations of intellectual and rational power are to be traced to the ovum in which life-movement has its rise. That 'the germ-cell produces all' that belongs to *organic* life, may be accepted as a maxim; but science is without data for any wider conclusion.

As to organic development, there are two available points of observation, that of the mature organism; and that of the germ-cell. Darwin, as a biologist, trained in observation

[1] Weismann's *Heredity*, vol. i. p. 167. [2] *Ibid.*

of comparative form, colour, and functions, naturally prefers the standpoint supplied by the mature life. Weismann, as a histologist, skilled in microscopic research, naturally concentrates on the germ-cell, with its nucleus, and nuclear fibres. Only by coalescence of these two methods of observation can a completed theory be formed; and from this we are still far removed. Each step in advance, from whichever side, must carry some promise of reconciliation.

We are still, however, dealing only in conjectures, being limited to the balance of probabilities. Darwin adopted the hypothesis that the germ-cell, in the parent body, receives contributions from all the cells of the body, thus containing analogous parts, for reproduction, in the offspring. This is the hypothesis known as *Pangenesis*, derivation from the whole, in order to transmission of specific features. The cell, thus regarded, is a miniature of the body. This theory 'assumes that *gemmules* are thrown off from each different cell or unit throughout the body, which retain the characters of the cells from which they spring; that the gemmules aggregate themselves either to form, or to become included within, the reproductive cells; and that in this manner they, and the characters which they convey, are capable of being transmitted in a dormant state to successive generations, and to reproduce in them the likeness of their parents, grandparents, and still older ancestors.'[1]

On this hypothesis, Darwin seeks to account for transmission of minute variations, along with those essential to the species. He gives prominence to the following facts. 'Two distinct elements are included under the term "inheritance," —some appearing at birth, some "transmitted through the early years of life," which are developed only at maturity, or during old age.'[2] 'A new character appearing in a young animal, whether it lasts through life or is only transient, will, in general, reappear in the offspring at the same age, and last for the same time.'[3] 'Most of our domestic races have been formed by the accumulation of many slight variations.'[4] 'All these cases are intelligible on the hypothesis of pan-

[1] Sir W. Turner's Address, p. 3.
[2] *The Descent of Man*, p. 227.
[3] *Ibid.* p. 228.
[4] *Ibid.* p. 230.

genesis; for they depend on the gemmules of certain parts, although present in both sexes, becoming, through the influence of domestication, either dormant or developed in either sex.'[1] Any marked gain in structure and function thus depends on inheritance of acquired characters.

Weismann concentrates on the structure of the germ-cell, and the history of its movements. In accordance with the cell-theory, life begins from germ-plasm, and assumes its primary individual form in a germ-cell; for all life, germ-cells have a common structure, so that it is impossible to distinguish species by observation of the characteristics of these cells; and yet, they have, in their distinctive constitution, provision for all that belongs to their species. As to the origin of these germ-cells, the ordinary hypothesis 'assumes that the organism produces germ-cells afresh, again and again, and that it produces them entirely from its own substance.' This, Weismann denies. The germ-cells are quite severed from all the other cells of the parent body, and have their distinctive and exclusive function as reproductive cells. Giving prominence to these facts, Weismann adopts the hypothesis of 'the continuity of the germ-plasm,' holding that it is passed on from generation to generation, only a part being used up in the origin of a new life. Weismann states his argument thus:—'Either the substance of the parent germ-cell is capable of undergoing a series of changes, which, after the building up of a new individual, leads back again to identical germ-cells; or the germ-cells are not derived at all, as far as their essential and characteristic substance is concerned, from the body of the individual, but they are derived directly from the parent germ-cell.'[2] He prefers the latter alternative. His hypothesis is 'that in each ontogeny, a part of the specific germ-plasm is not used up in the construction of the body of the offspring, but is reserved unchanged for the formation of the germ-cells of the following generation.'[3] According to this view, 'the nuclear substance is the sole bearer of hereditary tendencies.'[4] Hence, acquired variations cannot be trans-

[1] *The Descent of Man*, p. 231.
[2] *Essay upon Heredity*, vol. i. p. 170.
[3] *Ibid.* p. 170.
[4] *Ibid.* p. 180.

mitted. A start is obtained only by union of the 'nuclear substance of the male and female parents,'[1] 'the fusion of two hereditary tendencies.'[2] On this hypothesis, the germ-plasm is in itself the centre of vitality, having true continuity of existence—a kind of 'immortality,' he would say,—but it is such 'immortality' as pertains to a continuous reproductive process. Individual life has thus only its limited term, advancing to maturity, thereafter yielding to decay, and departing without even handing on acquired variations, 'profitable to the individual under its conditions of life.' Such, in outline, is Weismann's hypothesis. He does not claim that it is more, saying, 'it is possible that continuity of the germ-plasm does not exist in the manner in which I imagine that it takes place, for no one can at present decide whether all the ascertained facts agree with it, and can be explained by it.'[3]

When these hypotheses are deliberately examined, both seem burdened with difficulties so great as to make their ultimate acceptance improbable. To say that the varied parts of a complex structure, or that the several groups of cells concentrated at different centres within it, give off gemmules which travel towards the germ-plasm, there combining to contribute towards the structure of the several germ-cells, is to suggest a method so cumbrous that we are apt to think it is the fruit of imagination, rather than a discovery of Nature's methods. Even making allowance for the grand specialty of reproduction, this hypothesis is against the analogies of cell-life, in accordance with which quite distinct groups of cells provide for distinct functions within the organism. On the other hand, to say that the germ-cell, or ovum fertilised by the spermatozoon, not only provides for the development of the most complex organism, but holds in reserve within its own structure a sufficient supply of germ-plasm to provide for continuance of the species through successive generations, is a suggestion which seems equally removed from the simplicity of Nature's methods, as it is at variance with the reappearance of parental characteristics in the children of a family. We

[1] *Essay upon Heredity*, vol. i. p. 181.
[2] *Ibid.* vol. ii. p. 111. [3] *Ibid.* vol. i. p. 176.

cannot wonder that Weismann himself should say, 'that no one of the many attempts to solve the problem . . . can be regarded as even the beginning of a solution' (Weismann, *Heredity*, vol. i. p. 167). The advantage seems to be with Darwin, for he deals with the *genesis* of the germ-cell, whereas Weismann is concerned mainly with the *transmission* of it from generation to generation.

That the dependence of the germ-cell on the parent organism is closer in human life than Weismann suggests, seems certain on physiological grounds. The segregation of a definite group of cells for reproductive functions does not imply their severance from the parent body, but physiological dependence on its vital energy, since the germ-cell continues in intimate relation with the vascular and nervous systems within the parental life. Although the germ-cell has a function *beyond* the mature parental life, this function is fulfilled *within* the uterus, after fertilisation has occurred. The course of germ-development, therefore, is dependent on the functional activity of all the other groups of cells within the parent body. In the case of mammals, we must modify the statement that the germ-cell is 'thrown off from the organism,' in order to make acknowledgment of vital relation with the mother-life essential for development of the germ. This is a phase of 'dependence on development,' while the energy on which growth *primarily* depends is vested in the fertilised cell itself. The genesis of the germ-cell remains a secret. We know something of how the germ-cells are constructed and separated 'from amongst the millions of most various kinds'; of the manner in which the cell becomes active; something of the successive stages of advance in course of its activity during the embryonic period; but how the distinctive function is provided for we do not know. That the *reappearance* of germ-plasm is an event included within the development of the individual life seems more probable than Weismann's conjecture, that the germ-cell comes from a 'parent germ-cell,' only indirectly from the parents.

The accumulated results of observation, and the general tendency of physiological science, favour the conclusion, that the fertilised ovum builds up the new organic life, including

the germ-plasm. It being granted that the germ-cell, nourished by the mother-life, is capable of reproducing the elaborate organism, it seems only natural that there should be included within its growth the genesis of fresh germ-cells, as well as of liver cells, and nerve cells, and cells of the muscular tissue. On the other hand, however, it does not seem possible to maintain that the hypothesis of *pangenesis* is a reliable interpretation of the process for renewal of germ-cells. The problem of their genesis remains unsolved.

The *activity within the undifferentiated cell* must for the present guide us in conjectures as to the activity of the germ-cell. In both cases, growth of life must be by nutrition and subdivision of cells. On the other hand, the inherent energy of the germ-cell must provide for differentiation in organism. The difference both of structure and function between the two sets of cells has its explanation in heredity. In the history of advanced species, the results of ages of work are impressed on the cellular tissue, so that they cannot fail to reappear, unless the needful *external* conditions are withheld. Embryological research has proved that higher organisms pass through analogous preliminary stages, in advancing towards specific differentiation. Facts seem to confirm the view that the growth of the germ-cell follows the analogies of growth in the simple cell. Science must still wait for deeper research into these analogies.

The general tendency of scientific inference as to the phenomena of reproduction becomes obvious. Growth itself is a struggle towards differentiation. While this is in process, reproduction is *deferred* till the complex structure has reached maturity. Appearance of sex as an instrument for reproduction defers this as an end later of achievement. Inheritance realised in a new life, whatever the form of that life be, marks a definite stage of historic advance; this is demonstrated in *species*. Reproductive power appears in a dualism of life. The promise of advance depends henceforth on the union of *two* hereditary tendencies within an individual life. How the result is achieved after the fusion of the male and female nucleus, remains one of Nature's secrets. The scientific problems awaiting solution are these:

the genesis of the germ-cell, and the phases of its activity, when the energy of the fertilised cell has been started within the uterus. *Amphimixis* is the key to organic advance. Certain as this is, we are still in large measure uncertain as to the manner in which the fertilised germ-cell carries through the process of development within the embryological period. It cannot be overlooked, however, that all life-energy works in the face of innumerable hazards of degeneration. Success and defeat reappear in company at every point in history, a fact on which the Darwinian theory rests securely.

The general conclusions thus briefly stated are the reward of the combined efforts of the naturalist and the histologist. To the latter must now be handed over the larger part of the work still to be overtaken; and that work must include the two problems,—the *genesis* of the reproductive cell, or of germ-plasm; and the essential characteristics of the *activity*, which builds up such an organism as that of the higher mammals.

From dualism of sex, we are brought back to unity of life, the unfolding of the individual, whatever its species. In course of the wide historic advance, we come once more upon a *dualism*; but this time within the individual life, when organic life is allied *with intelligence*. Within the individual life there is the distinction of physical and psychical, leading science towards further discussion, now familiar, as to the genesis of Mind in animal and in man. The significance of this distinction is not as yet quite obvious to those fascinated by the hypothesis of Evolution. A theory which has brought all organism under a single law of continuity fights hard against admission of a fresh dualism. Such a theory yields only before dire necessity. The fight towards sure induction makes large demands on all concerned in it. There must be time for gathering of evidence, for fair interpretation, for criticism of hypotheses, and for gradual elaboration of scientific induction. Enough of uncertainty hangs around the activity of embryological life, to afford scope for large conjecture.

To aid appreciation of the range of inquiry, the distinctive

features of *mental phenomena* must be noted. These lie apart from all organic action. They are not included within phenomena of motion,—not even within selective actions,—not even within purposive actions. All these are traced at the very basis of *organic* life,—the Cell; for even this minute organism moves, selects its material, and is purposive in its activity. Mental activity interprets sensory experience, providing for application of the interpretation in action. In human life, the reflective process shapes everything, and all other psychical phenomena depend on this. Further, it is to be observed that mental activity provides for the performance of organic effort in new ways, and for wider ends. Mental phenomena appear *with* the organic, yet distinct from them Hence the dualism. Naturalists, histologists, and physiologists are at work within areas of research where *no account* is made of mental phenomena. Hence the discussion of Heredity in the pages of Darwin, and of Weismann, does not bear with equal directness on the appearance of mind, and bears but slightly on the processes in which physical and mental phenomena blend. The naturalist gathers more evidence here than the embryologist does, for the one relies on observations of human life, the latter is engrossed with research into minute organic forms. The beginnings of life being concealed from view, we are left in uncertainty as to the earlier processes. A completed theory of heredity is, therefore, unattainable; and still further beyond our reach is any scheme showing how the appearance of mind has been included in the history of biological advance.

Either we must hold that the germ-cell from which the human individual springs, exhausts its energy in somatic results, as in lower organisms; or we must hold that the human germ-cell is strangely different in structure from other germ-cells, so providing for rational life. Biological science is placed in peculiar difficulty here, for its tendency is to deny the presence of anything special or peculiar in the structure and functions of the human germ-cell. How, then, is man's amazing superiority to have scientific explanation? No satisfactory answer has yet been offered. All are agreed that the energy of the germ-cell, sustained by the

energy of a mother-life, accounts for the completed somatic life appearing at the birth of a child; but how the superior intellectual life is to be explained, there is no evidence to show. That the first appearance of mental activity in an individual life belongs to the embryological period is generally granted;[1] but our knowledge of the stages of advance within the fœtal period helps nothing towards a theory of the dawn of consciousness. The inadequate range of such knowledge as we have is very manifest. So long as we are concerned exclusively with somatic life, we regard man simply as a member of the animal kingdom. The structure of the germ-cell, the effects of its fertilisation, the union of two hereditary principles, and the start of organic movement within the cell, are the same in human life as in animal life generally. But such similarity fails to account for that which is distinctive of human life. The most sanguine of scientists are still entangled in research as to the transference of hereditary protoplasm, the significance of the expulsion of 'polar bodies,' or the formation of nuclear fibres into spindles and plates during nuclear division.[1]

The testimony from Embryology is far from yielding the support to an evolution theory which has been hastily assumed by some. The human fœtus passes through stages of advance very closely resembling those of the higher animals. The similarity is very striking; and the first discovery of the facts naturally made a deep impression. Quotations from Darwin and Huxley will indicate how high a value has been assigned to morphological analogies. Under Embryonic Development, Darwin says: 'Man is developed from an ovule, about the 125th of an inch in diameter, which differs in no respect from the ovules of other animals. The embryo itself, at a very early period, can hardly be distinguished from that of other members of the vertebrate kingdom.'[2] Huxley says: 'It is very long before the body of the young human being can be readily discriminated from

[1] Percy, *First three years of Childhood*, Transl. 1 ff.; Preyer, *Die Sede des Kindes*, Preface to first edition.

[2] Will any one support the hypothesis of Jäger, that 'soul-stuff' comes from 'decomposition of albumen in many parts of the body'?—'Zur Pangenesis,'—*Kosmos*, iv. 376, 1879.

[3] *Descent of Man*, p. 9.

that of the young puppy.' Lured by these resemblances, evolutionists supply sheets of illustration, such as we have in Haeckel's *History of the Evolution of Man*, and reproduced in Romanes' *Darwin and After-Darwin*, pp. 152, 153. These add to the vividness of our conception of general conformity to a structural type. But, recognising these facts, what inference do they warrant? Do they imply or suggest any explanation of the appearance of the distinctive features of our race? Quite otherwise. The more like the fœtus of man is to that of the animal races, the less evidence can Embryology supply towards a theory of the genesis of mind. The more akin the structure of man is to that of animals, in the early stages of development, so much the less is the significance of organic structure when we come to explain intellectual life. It is here we mark the weak point in Huxley's reasoning when he says: 'If man be separated by no greater structural barrier from the brutes than they are from one another, then it seems to follow that if any process of physical causation can be discovered by which the genera and families of ordinary animals have been produced, that process of causation is amply sufficient to account for the origin of man.' [1]

If next we turn to external observation of the ordinary life of man for evidence of heredity in mind, no one is likely to offer a completed theory. If the activity of the germ-cell in building up the organism eludes observation, preventing attainment of a finished theory, much more must our difficulties here prove insuperable, as we seek to trace heredity in the history of mind. Within biological history, it is impossible to trace either the genesis of mind in Nature or its appearance in course of individual development. At what stage, and under what conditions, mental phenomena first appear in the life of a child, it is impossible to say. That the mother-mind and the mind of the fœtus work in sympathy, and to some extent in unison, seems clear. In this a basis is supplied for a theory of heredity in mind. Extended observation, bearing on the history of families, enlarges the data at command. Galton's observations have

[1] Huxley, *Man's Place in Nature, and other Essays*, p. 146.

rendered effective service in this field, showing a continuity of talent among the descendants of men of marked ability.[1] But these observations are restricted in so many ways, and are so partial in their reference, that it is impossible to formulate a theory upon them. Alongside of the examples of hereditary ability, we need to have examples of the failures in continuity, which are certainly numerous. We need, besides, to ascertain the conditions, social and educational, contributing towards recorded results. On the other hand, we are far from any theory of the appearance, often noted, of high genius in unpromising quarters. While, then, heredity in mind is placed beyond question, the conditions on which it depends are still involved in obscurity. Such light as is shed upon it by the physical and psychical data at command confirms the view of a double life, with a dual phase of inheritance. The germ is directly and efficiently concerned with the somatic; it is not shown by any definite line of evidence that it provides for the appearance of mind; nor does it account for the differences in mental life recognised among us, except in so far as we admit the influence upon mind of a closely correlated organism, constantly receiving an impress from higher power in the mother-life.

A summary of positions sustained by adequate evidence may now be given. The basis of life for man, as for all animals, is organic. His life originates in a germ-cell or egg, developed within the uterus, dependent on the nutriment which the mother-life supplies.

The first position as to heredity in the case of man includes all that is common to higher animal life. Individual life is, in its first stage, the growth of the ovum from the moment of fertilisation onwards to the moment of birth. The life-energy here at work springs from the fusion of two hereditary tendencies, by the blending of male and female nuclei, individuality being marked by the combined agency of these two forces, under the conditions of embryonic life. The law of descent is that according to which a single cell 'is able to separate itself from amongst the millions of most various kinds of which an organism is composed, and

[1] Galton, *Hereditary Genius*.

by division and complicated differentiation to reconstruct a new individual with marvellous likeness'[1] to the stock from which it comes. This law has maintained the identity of species 'unchanged in many cases throughout whole geological periods.'[2] Scientific demands require that—'A satisfactory theory of heredity must explain what it is in the structure and organisation of the ovum, which determines that each ovum should produce its proper organism.'[3] Allowing for the full extent of meaning belonging to the *common* phases of animal descent, we must thereby interpret the speciality of human organism. Whatever may afterwards be said as to intellectual and emotional phenomena, and as to moral and religious aspects of human life, must have its added significance determined in full view of this law of physical heredity. Man has his place among the animals,—his organism appears in the continuity of biological history. 'It is as if Nature herself had foreseen the annoyance of man, and with Roman severity had provided that his intellect, by its very triumphs, should call into prominence the slaves, admonishing the conqueror that he is but dust.'[4]

Besides this, however, the *mental* life-characteristic of the species appears within the fœtus during its development. The conditions providing for its appearance are unknown. Mind, in its opening history, is intimately associated with the unfolding of the organism. A sensitive relation is established, even before dawn of consciousness, under conditions of experience determined by the action of the mother-mind. The activity of the mother-mind is the 'education' of the germinal mental life, so far as it can be under organic conditions. The child lives in sympathetic *feeling* with the mother-mind, without participation in the thought-exercise. Even thus, the human fœtus must have an experience largely above that of the animal fœtus. Mind first acts through organic media, under influence from the parent mind. The evidence of this is given in the consciousness of the mother. The confirmation is found in the characteristics of individuality in after life, showing heredity in mind, as well as in organism. In the

[1] Weismann's *Heredity*, Transl., vol. i. p. 167. [2] *Ibid.* vol. i. p. 167.
[3] Huxley, *Man's Place in Nature, and other Essays*, p. 146. [4] *Ibid.*

history of heredity there is, under physiological conditions, a much more direct and sustained influence of maternal than of paternal influence. Yet, as illustrating the closeness of relation between the organic and the mental life, it is manifest that the child shows in mind, as in body, the traces of a dual principle of heredity. This is a statement resting on a wide induction. To some it appears to favour a conclusion that the life is wholly organic, mental activity being held to be a function of organic structure. The inference is unsustained by evidence. If bodily activity represented the whole, we should have no warrant for the distinction between psychical and physical; a good physique would present the maximum of good, under the law of heredity, just as it is in animal life, —a conclusion which is contradicted by the whole course of human history.

CHAPTER V

THE LOWER FORMS OF LIFE

In order to approach more advanced problems with some regard to natural perspective, we must at least trace a pathway through the midst of the lower orders of life. We shall thus be able to ascertain how far these lower forms seem to supply warrant for a general theory of Evolution, and, at the same time, how far they offer testimony bearing on the genesis of mind. Granting organic evolution, the main question remains,—Can the appearance of Intelligence be explained by differentiation in the course of evolution of organism? Can Mind have had its genesis from non-mental antecedents, at any fixed point in organic evolution? Towards an answer, it will be of the first consequence to ascertain the potentialities of the lower forms of organism.

A tendency has recently appeared to attribute Mind even to the protozoa. This, however, is not the product of observation directed on the lower forms of life, but of a deepening sense of the difficulty of tracing the boundary line, at which we may mark the appearance of Mind. The success of Physiology disposes of the hypothesis, sending back our main perplexity to its old place among the higher animals. Physiology so fully explains organic action in lower forms as to render untenable any theory of the genesis of mind at an early stage, when organism was still simple in structure. Only when phenomena of life prove incapable of explanation by reference to structure, is it warrantable to postulate a higher power. A completed physiology of the functions of protozoa, therefore, disposes of the hypothesis that organism and mind are uniformly conjoined. The day has gone by, when any scientific value can be assigned to Darwin's sug-

gestion of 'mental power in one of the lower fishes,' such as 'a lamprey or lancelet.'[1] Inquiry must now be carried forward to that comparison on which Darwin afterwards concentrated when intelligence was assigned exclusively to 'man and the higher mammals,' whose 'mental faculties'[2] were investigated in detail.

A very important contribution to the general discussion is, nevertheless, to be secured by observations concentrated on the lower forms of life. These determine for us how much action is within compass of organism. At the basis of all organic existence, *cell-life* illustrates selective and purposive action. These phases of activity are traced in the movements even of microscopic forms. We therefore conclude that such action belongs to living organism, from the lowest to the highest, and that this has been the function of organic life from its first appearance on the earth. Wherever life is present, even in germinal form,—when it is merely a fertilised ovum,—its action is selective and purposive. Apart from this, development of the *germ* is impossible.

Important results follow, influencing greatly all subsequent discussion. Action, selective as to nutritive material, purposive in respect of organic development, is characteristic of organism, quite apart from mind. Under all varieties of animal form, purposive action is an organic function, dependent on structure. In human life itself, action is often erroneously traced to an intellectual source. The facile reference to intelligence here, has naturally appeared, in absence of scientific knowledge of organic functions; hence the easy resort to conditions of our own experience for explanation of animal activity. With the more exact knowledge now at command, it is pressed upon our notice, that there must be in human life a large range of activity, both selective and purposive, which bears no evidence of intelligence. In some very striking respects, indeed, we must allow that organic and mental functions approximate, when we judge of their results, so that 'purposive action' *belongs to both*, though originated in different ways. The 'purposive' is not distinctive of intelligence; we

[1] *Descent of Man*, p. 65. [2] *Ibid.* p. 66.

mistake, therefore, if we infer the presence of animal intelligence because of purposive action, for such action appears even in a cell. An exact conception of the action of the lowest organism is thus a primary requisite for development of comparative biology. When purposive action is distinctive of *mind*, we trace a *voluntary* phase of selection, depending on reflective power, in contrast with selection by *sensibility*. Thus, we refer to certain phases of action, such as a thought-process, as voluntary, being carried out for a definite end, which we recognise as desirable. At the same time, when we restrict attention to material existence, including all organic life on the earth, it is clear that all movement in Nature is securing a definite end. The testimony for biological evolution, by struggle for existence, is of itself a vivid illustration, sustaining a still wider induction.

Having seen that two distinct phases of selective and purposive action are observed in life, the one organic, the other mental, we require to define more exactly the activity possible to organic structure in itself. We seek thus to make more vivid the antithesis between Organism and Mind. For this, we must concentrate on the lower forms of animal life. It will thus become apparent how, if differentiation of structure be secured, this provides for *diversity of purposive action*. Varieties of activity must first be noted, and these will be connected with structure as their source.

In carrying forward this inquiry, there are many advantages obtained by concentrating observation at first on the protozoa. The lower the forms of life, the more simple does it become to observe organic functions with accuracy. In a sense, Nature here does for the observer the work of analysis, anticipating the task of the anatomist; there is a further advantage, for Nature's analysis makes no breach on life-energy, occasions no pause in fulfilment of function. In process of evolution of life, Nature shows us in her successive steps of advance, the extending possibilities of organic function, as differentiation of structure appears. We see life-energy expanding even in the adaptive power of cell-growth. Nature thus becomes our guide in the study of 'gradual deviations,' directing our inductions in distin-

guishing between sensibility belonging to organic life from its first appearance, and 'consciousness' in which sensations stand in contrast with their interpretation. When making account of the excitation and movement common to organism, we do not separate animals from plants, for 'there are plants which possess irritability, and the power of free movement.' When this single fact is considered, we are warned against a facile reference to 'Voluntary movement,' when speaking of the excitation of organic structure. What is meant by 'Will' is a question not to be easily disposed of,

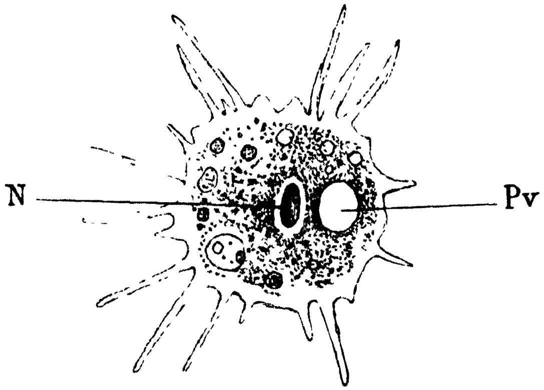

FIG. 1.—A Protozoon—*Amœba polypodia* (after Fr. E Schultze).
N, nucleus. Pv, pulsating vacuole.

any more than the question, what is to be understood when we attribute 'consciousness' to any given order of life? 'Irritability as well as contractility appears to be a property both of vegetable tissue, and of the protoplasm of vegetable cells.'[1] We are thus assured by wide induction, that *purposive action belongs to all living organism.* We have now to consider its conditions, as these are seen in the activity of the lower animals.

As life-history begins with cells, it advances by 'cell aggregates,' securing expansion, and progressive differentiation. Activity, seen in the single cell, is extended by multiplication and concentration of cells. There are thus two phases of activity, one seen in single cells, separate from

[1] Claus, *Text-Book of Zoology*: Sedgwick, i. p. 23.

each other; another, in the combined activity of cells 'placed near one another, forming part of an aggregation of cells, spread out superficially.' The nucleus of the cell is commonly regarded as the source of activity. Additional powers of reproduction and combination provide for advance in activity, the value of the gain being as marked in combination as in reproduction. Next, in the history of advance, there is activity resulting in the sending forth of an expanded structure, giving rise to differences in shape, preparing for fulfilment of distinct functions. This is the first step towards division of labour in the activity of organism, landing at length in the structure of distinct *organs*. This action is illustrated in an example of the protozoon (Fig. 1).

We thus pass to the individual animal, marking first the common activity whose end is appropriation of nutriment; absorption of means of subsistence being characteristic of all animal activity. We witness this in its primary form, when structure is at its simplest.

Take the *Vampyrella*, described by Professor Horsley[1] (Fig. 2)—a protozoon, in which no nerve-system has yet been detected.

This animal is simply a soft, spherical body, sending out lengthened fibrils in search of food supply. Its power of expansion is strikingly shown when nutriment lies beyond reach of the normal form of the living structure. This species, when 'wandering about algæ which are composed of tubes of cellulose, with a core of chlorophyll and other nutritious substances, if it comes opposite the open end of such a tube, down which its food may be lying at a con-

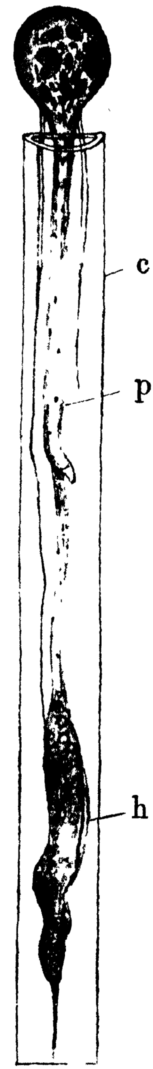

FIG. 2.
Vampyrella (Cienkowski).
c. tube of cellulose.
p filament of Vampyrella.
h. nutriment.

[1] *Brain and Spinal Cord*, p. 31.

siderable distance, it will nevertheless send down the tube a filament, having a length many times greater than the diameter of its own body, to reach the object of its search.'[1] The figure illustrates the method adopted. It is incidentally suggested at the same time, how changes in form arise, and how these may become fixed. We must also carry with us this additional consideration, that change in the form of the cells *within* the organism is taking place along with the change in outward form of the organism. Consequent on such changes, internal and external, occurring together, difference of species appears.

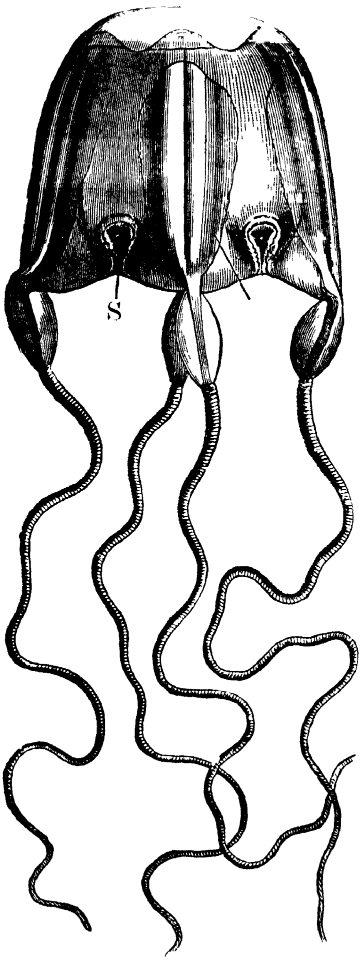

FIG. 3.—*Charybdea marsupialis*, natural size (after Claus).
S, sense organ.

For purposes of illustration, we pass to the Medusæ,—the jelly-fishes,—with their wonderful varieties of beauty in form and colour, finely depicted in Haeckel's *Atlas of Medusæ*. A familiar form will suffice to illustrate structural advance (Fig. 3). Here appears the first stages of a nerve-system, including special forms of nerve-cell, the aggregation of such cells, and the formation of central bodies placed in relation with organic structure, and concerned with movement. In these lower forms we already trace 'the struggle for existence,' characteristic of animal life. The organism is indeed of a comparatively simple type, and yet

[1] Horsley, *Brain and Spinal Cord*, p. 31.

when the illustration presents to observation the structure as seen under the microscope, it is manifest that an elaborate

FIG. 4.—Longitudinal section through the nerve ring of Charybdea (Claus). Sz, sense cells in the ectoderm; Gz, ganglion cells; Nf, nerve fibres; Stl, supporting lamella, E, entoderm cells.

arrangement has been here developed, providing for the movement of the jelly-like mass, and at the same time supplying not only sensory and motor apparatus, but also instruments of attack. A section of the nerve will show this elaboration (Fig. 4). Sensory and motor apparatus is thus suggestive of a further advance in the relations of organism to its food-supply. Wider harmonies of life and environment are being achieved with advance in structure, by energy of the living cells, at work within the hidden laboratory. In Fig. 4, the sense organs are marked. A magnified representation will show how complex the structure is (Fig. 5). We are here still concerned entirely with structure, its sensibilities to external influence, its movement under sensible attraction, its appropriation of nutriment with consequent support and development of structure, and its capabilities of securing advance. This whole range of activity is definitely explained by reference to the structure of the Medusa, and the functions naturally belonging to it. A longitudinal section of the Medusa will further illustrate the structure (Fig. 6).

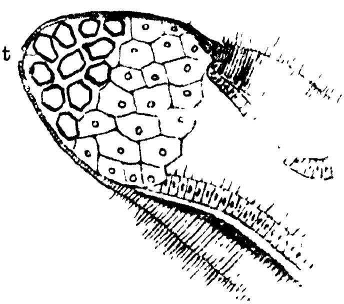

FIG 5.
Section through the sense organ and its nerve centre; cf. *Aurelia aurita* (from Claus). Ot, otolith of auditory sac, P, eye spot.

There is no evidence for the presence of mind here.

Organism is seen exercising functions provided for by differentiation of structure. Life, even the lowest, cannot be

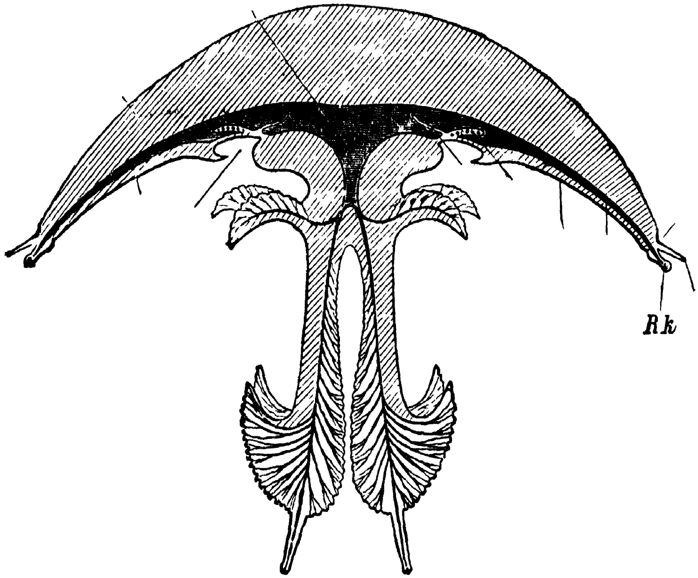

FIG. 6.—Diagrammatic longitudinal section through a Medusa (Rhizostoma) showing umbrella, gastric cavity, and Rk, sense organ (from Claus).

sustained except on these conditions. Within the simplest forms of organism the potentialities of structure may be advantageously studied. Beyond these, we learn how differentiation provides variety in the range of functions which have already appeared. Phenomena of mind must be traced quite beyond all this, in functions for which structure offers no explanation. Mind has its own selective and purposive action, but in higher phase, securing results proportionately in advance. When this contrast is introduced, we are distinguishing between activity springing from organic impulse, in some form of sensibility; and activity springing from understanding and will,—from deliberate purpose, which knowledge consciously warrants.

CHAPTER VI

ANIMAL INSTINCT

WHATEVER differences of view there may be as to Instinct, there is comparative agreement in the inclusion of a definite class of phenomena under this name. The honey-storing of the bees, the web-weaving of the spiders, the nest-building of the birds, their migration and direction of flight, are accepted as unquestionable examples of Instinct. These are neither reflex nor intelligent actions; they illustrate congenital aptitude for which experience within the life of the individual is non-essential. Reflex action, no doubt, blends with the instinctive, in so far as the former is essential to general bodily movement; Intelligence may also contribute to the result, along with Instinct, as in the case of man; but even the combination of these three does not obscure the distinctive character of each.

There is more hope of exactness in recording our observations, if we concentrate on phenomena recognised as instinctive, rather than on definitions of Instinct which have been proposed. Maintaining the contrast between reflex action on the one hand, and intelligent action on the other, we can proceed, with comparative agreement, as to the area of research. This is matter of no small moment, permitting us to concentrate on a large and deeply interesting set of phenomena, belonging to more advanced forms of organised existence.

The transition from lower to higher organism marks the pathway for advance in biological knowledge, as it shows the lines of advance in natural history. The progress from protozoa to medusæ leads onward to the phases of Insect life, presenting a field of observation within which Instinct is seen

at its best, the nerve-system having been evolved in greater elaboration. We include here all phases of instinctive action, whether periodic, as in the nest-building of birds, or persistent, as in the working of the ants when building the ant-hill.

In dealing with such phenomena, we shall find considerable advantage from distinguishing, as Professor Lloyd Morgan suggests, between congenital movements and acquired aptitudes; but it is needful to remember that both a congenital and an acquired element appear also in automatic or reflex movements, for 'congenital' applies to the earliest phases of sensibility and motion, while acquisition is a feature in all sentient existence, as is implied in a theory of Evolution. So also on the other side, instinctive and intellectual elements are continually combining in course of the acquisitions peculiar to a rational being. There is, however, a well-defined boundary line within which the phenomena of Instinct are gathered, for instinctive action transcends reflex, as it falls beneath intellectual action. In advance of the action of the sensory-motor nerves, and the activity belonging to the vital organs, there is action of a higher order concerned with the activities of distinct animal species. The phases of instinctive action appearing in the life of insects and of birds surprise us most, being much more remarkable than the instincts of the mammals. This difference is recognised when attention is directed to the activity of spiders, bees, wasps, and ants. Within this more limited circle the greatest marvels appear. When insects and birds are placed in contrast, the instincts of insects are seen to be persistent, whereas many of the instincts of birds are marked by periodicity, being largely restricted to the nesting season. When we pass to mammals, there is, I think, a manifest diminution in the variety and the complexity of instinctive action. On recognition of these contrasts, it seems warrantable to trace a varying distribution of Instinct within the animal kingdom. In the lowest orders, there appear automatic and rhythmic actions, without instinct, as in the protozoa and the medusæ; in the life of intermediate orders, showing important structural advance,

instinctive action is the highest possible, as in spiders, bees, and ants; when some phase of intelligence appears, as in the higher mammals, instinct is simpler and less varied.

That the mammals are less distinguished by phases of instinctive action is a fact which has engaged the attention of Darwin and other observers. Thus Darwin says, 'The fewness and the comparative simplicity of the instincts of the higher animals are remarkable in contrast with those of the lower animals.'[1] This fact is one of first importance affecting the entire study of the subject; yet its bearing on the comparative phases of animal activity has not been considered as it deserves. For a successful study of Instinct, attention must be concentrated on those animals in whose activity instinctive forms are at once more numerous and more complex. Only by this method can we hope to construct an adequate theory of Instinct. In neglect of this, the facts are covered up, or thrown out of view, on the suggestion that we must assume intelligence as co-operating with instinct. This tends greatly to complicate Darwin's discussion, as it appears in the *Origin of Species.* Instinct is a distinct feature of life; it stands in contrast with Intelligence; the one designates action independent of experience, the other, action possible only by lessons drawn from previous effort; the one is action without knowledge, the other is action dependent on knowledge. Darwin notes this contrast when he says, 'An action, which we ourselves require experience to perform, when performed by an animal, more especially by a very young one, without experience, and when performed by many individuals in the same way, without their knowing for what purpose it is performed, is usually said to be instinctive.'[2] Such action is illustrated in the case of the caterpillar reported by P. Huber and quoted by Darwin. 'If he took a caterpillar which had completed his hammock up to, say, the sixth stage of construction, and put it into a hammock completed up only to the third stage, the caterpillar simply re-performed the fourth, fifth, and sixth stages of construction. If, however, a caterpillar were taken out of a hammock made up, for instance, to the third stage,

[1] *Descent of Man*, p. 67. [2] *Origin of Species*, p. 191.

and were put into one finished up to the sixth stage, so that much of its work was already done for it, far from deriving any benefit from this, it was much embarrassed, and, in order to complete its hammock, seemed forced to start from the third stage, where it had left off, and thus tried to complete the already finished work.'[1] The phenomena of instinct are in this respect distinct from intellectual phenomena, though Darwin speaks of 'mental powers' and 'mental qualities' as involved, and of the 'frame of mind' in which an instinctive action is performed. How unwarranted by evidence, and how detrimental to a scientific inquiry, this mixed representation is, will appear by reference to Darwin's definition, just quoted, where it is stated that an instinctive action is done 'without experience' and 'without knowing for what purpose it is performed.' It is besides a noteworthy feature, that the animal does, without experience, 'that which we ourselves require experience to enable us to perform.' Is it not an additionally striking thing, that much is done instinctively by the animal that *we cannot do,* even with the aid of intelligence? By reason of these appeals to intelligence, essential features of contrast are being overlooked, and the issue is being obscured. We attribute to intelligence at one moment what we have assigned to instinct a moment before. When concentrating attention on instinct, we readily assume that 'a little dose of judgment or reason,' as Pierre Huber expresses it, 'often comes into play, even with animals low in the scale of Nature,'[2] and this 'little dose' is neither separated from instinct, nor is its presence accounted for, under cosmic law.

In studying the phenomena of Instinct, we are specially arrested and impressed by the fact, in its bearing on the general discussion, that all instinctive actions are *selective and purposive,* as related to the wants of the species. Many of these actions show aptitudes quite beyond our reach; and such actions are performed by animals 'low in the scale of Nature.' The consequent scientific demand becomes obvious. This activity is distinct from reflex action on the one hand,

[1] *Origin of Species*, p. 192. Some allowance may require to be made in such a case as this, for the amount of secretion under physiological law.

[2] *Ibid.* p. 191.

and from intelligent action on the other. The marvel is that organic structure can accomplish actions outstretching our powers. Towards interpretation of these facts, we recognise in many animals distinguished for high instinct a *marked superiority in sensibility.* This is the fact now to be held prominently in view.

We have only to go beyond our door in a morning of frost or heavy dew to see, all over the undergrowth, myriads of spiders' webs of the finest gossamer, so fine in structure that we do not observe their presence under ordinary atmospheric conditions. What can the higher mammals do that will compare with the work of the spider's web? We cannot imitate it without illustrating how inadequate are our aptitudes and appliances. Such work, finer than lace, is not to be equalled by animals with rougher instruments of manipulation. Sensibility, co-ordinated in a complex nerve-system, seems to account for the marvels of insect life. If so, instinct cannot be interpreted as Nature's preliminary stage towards evolution of intelligence. It is a provision for life-wants, antecedent to the dawn of intelligence. The power of instinct and the want of intelligence are strikingly shown in Insect life. The bee flying quietly through an open window, and afterwards working back towards the light, will toil and fret up and down the pane of glass a score of times, when free exit is within easy reach; yet how wonderful is the animal's Instinct in gathering and storing honey! Instinct is superior to intelligence in directness and precision of action within its narrow range of work; but vastly inferior in expansiveness, and in power to deal with a variety of demands. Bees and ants give evidence of selective power within their own limited range of effort, quite superior to that of the higher mammals. Unless full value be assigned to these facts, it is impossible to attain a scientific view of the progress of life on the Earth, or to indicate with any approach to precision the place which Intelligence holds in the universe.

Comparison of the several accounts of Instinct given by recognised authorities will show how much inquiries as to its nature are still involved in confusion. Professor Lloyd

Morgan has rendered valuable service by gathering a large number of the definitions of Instinct which have been given, and presenting these along with a suggested scheme of terminology. An important aid towards definite conclusions is thus rendered, for definitions can be focussed, while observations are so numerous and diverse as to baffle concentration. One of the most marked disadvantages clinging to our ordinary discussions of the subject is seen in the frequent references to 'intelligence,' 'consciousness,' and 'voluntary purpose' interspersed throughout. The only warrant for such references is evidence of the presence of *knowledge* in addition to organic sensibility and impulse. In order that evidence may be clearly traced, we must note how Instinct is *modified* under sentient experience; for, as Darwin shows, such modification does take place. References to 'experience' really cover one main source of the ambiguity here. There is an 'experience,' possible to sensitive structure, quite distinct in its causality, character, and results, from the experience acquired by us, when gaining accumulated knowledge. The test of accuracy here must lie in the contrast between organic impulse, and the knowledge of things and of their relations; in the contrast between sensitive experience and that larger 'experience' for which thought is a necessary condition.

When Darwin speaks of an action being 'performed by an animal, more especially by a very young one, *without experience*,' he does not suggest the absence of *feeling*, or of organic consequences depending on such feeling. The presence of feeling is admitted, and the consequences of it in the history of life are patiently traced. The whole theory of Evolution is built up in reliance on abiding impressions made on organic life by repetition of feeling. It is impossible to maintain that a fertilised germ-cell has no sensibility; or that such sensibility is wanting in the protozoa, when they send out processes in search of food. Thus the 'experience' implied in nerve-sensibility belongs to all life, and provides for possible advance in animal structure and function. Under such 'experience' it is that the structural advance is secured, which is transmitted to offspring.

What Darwin intends in marking the *absence* of experience, is the lack of reflection, and of its results in the guidance of action first, and in the history of species afterwards. This points to the absence of rules for action, which, when made, are applied in direction of conduct, for attainment of a foreseen end. The experience wanting in the animal is that which comes to us from looking 'behind and before,' receiving from the past a lesson which can be imaged in a better ideal, and can be ultimately realised in improved work. This is the 'Thought Experience' which the cell has not, and which insects cannot acquire.

Under Darwin's formula, 'activity performed without experience,' we place such facts as these:—that the young bee constructs its cell with exactness of form equal to that constructed by its progenitor; that the young spider spins its gossamer threads, and works up its web, as easily and well as do the 'old hands'; and that the young bird builds its nest as well as the bird that has practised the art through many seasons. The aptitude for the work is in all cases congenital; the young are not put to school to learn; the art belongs to them through the structure which they inherit. This is the characteristic of a sensori-motor structure to which is applied the name of 'Instinct'; and such Instinct appears in singularly high measure, and in most varied forms, in Insect life.

The absence of knowledge as a guide to the animal is clearly shown by Huber's illustration, already quoted, in the case of the caterpillar interfered with in making its hammock. Similar evidence may be gathered from all fields.

The ant is a member of a large community, accommodated within an ant-hill, pierced with many holes, as doorways, through which food stores are carried. The rounded heap of pieces of bark, pine-needles, fragments of wood, particles of sand, and nodules of gum, affords shelter for the colony, and the summit of the ant-hill is airing ground for the young in the sunshine. From below, the eggs are brought up by the nurses during the heat of the day, and are laid out to feel the warmth. If the sun goes behind a heavy bank of cloud, or if an east wind begins to

blow, lowering the temperature, the eggs are immediately lifted by the nurses and carried within, so that the airing-ground is speedily cleared. Such observations form a basis on which an estimate can be formed of the marvellous activity and high Instinct of the Ant. In quickness and persistence of movement, in sensibility to touch, in selective power as to food, and in its tenacity of grasp, this tiny creature is a marvel.

Illustration may be given from a long series of my own observations of Ants in the forests of Inverness-shire, where there are thousands of ant-hills, and millions of busy workers. The ants here under observation are for the most part the Common Wood Ant (*Formica rufa*), with occasional colonies of *Formica pratensis*. I select a hill about two feet in height and nearly three yards in circumference, the work of years of toil. This hill is connected by a clear pathway with a Scotch Fir, twenty-one feet distant. A cart track passes across this pathway of the ants, being formed in deep ruts on account of recent removing of timber. The workers crowd the entire pathway, perpetually going and returning, many of them seemingly bearing nothing back; many of them carrying fragments of bark or pine-needles, flies or wasps; occasionally a company of ants is dragging a dead beetle or caterpillar. Prolonged observation of this busy scene disclosed a great deal of jostling and of cross purpose amongst the workers. At a distance of about eighteen feet from the hill, I observed on one occasion an ant, bearing towards the hill, quite conspicuously overhead, a fragment of a flower, of such breadth and height as greatly to impede his progress. Those coming from the hill showed no appreciation of his efforts; for the most part they gave no heed to him; occasionally one or two stopped for an interview, rather hindering his purpose; very frequently outgoing workers, free from burden, passed over him, or over his 'find,' laying him prostrate. Through all this evil treatment, he held to his prize, the flower being borne aloft in the face of an opposing crowd, all running as if for life. At length he reached the edge of the wheel-track, nearly three inches in depth. He tumbled headlong with his load; others tumbled after, on the top of him, and these

scrambled away before him. More slowly, he followed across the bottom of the soft rut, and, fortunately, on the other side, he found an inclined plane, up which he dragged the leaf. He then held on his way with comparative ease, till he tumbled into the second rut. Here a serious barrier faced him; there was no easy incline on the further side; the ascent of the rut was nearly perpendicular; but he found a small cavern in the soft side of the rut towards which he dragged his flower, where he rested for a while. When he resumed his effort, he found the flower pressing awkwardly against the precipice, which seriously blocked his way. He wheeled the flower round into the track, and backed upwards on to a slight foothold above; next, continuing the backward movement, he succeeded in reaching a slight shelving part, which I had not till then noticed; at length he swung his flower in the air, wheeled suddenly round, and, by a strong effort, reached the top of the rut. From this he hurried along, bearing downhill for his home, for the ant-hill was on a lower level. This he shortly reached, and there he deposited his prize.

The structural adaptation of the ant to such activity as we have now described, has called forth Darwin's remark as to the conspicuous place which the brain of the ant holds in Nature,—'one of the most marvellous atoms of matter in the world.'

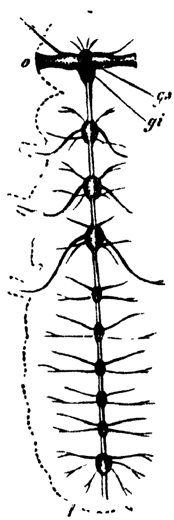

Fig. 7.—Nerve system of a White Ant. (*Termes.*) *o*, eye; *gs*, brain; *gi*, sub-œsophageal ganglion.

'The nervous system of insects presents a very high development, and a great amount of variation in arrangement.'[1] It commonly contains a 'ganglionic chain, consisting of about twelve pairs of ganglia.' This series of nerve-centres provides for the extreme and continuous activity of the several species. Each part of the articulated body has its own centre and nerve fibres, all closely connected with the main centre, which we name the brain (Fig. 7). The relative size and structure of the several centres are

[1] Claus, *Text-Book of Zoology*, transl.: Sedgwick, vol. i. p. 536.

such as almost to suggest that the work of the chief centre in the head is relatively less than in higher orders. The channels through which the greatest amount of nerve stimulus passes appear to be the antennæ and legs. The antennæ are in themselves a marvel of finely articulated structure, the minute details of which are visible only under

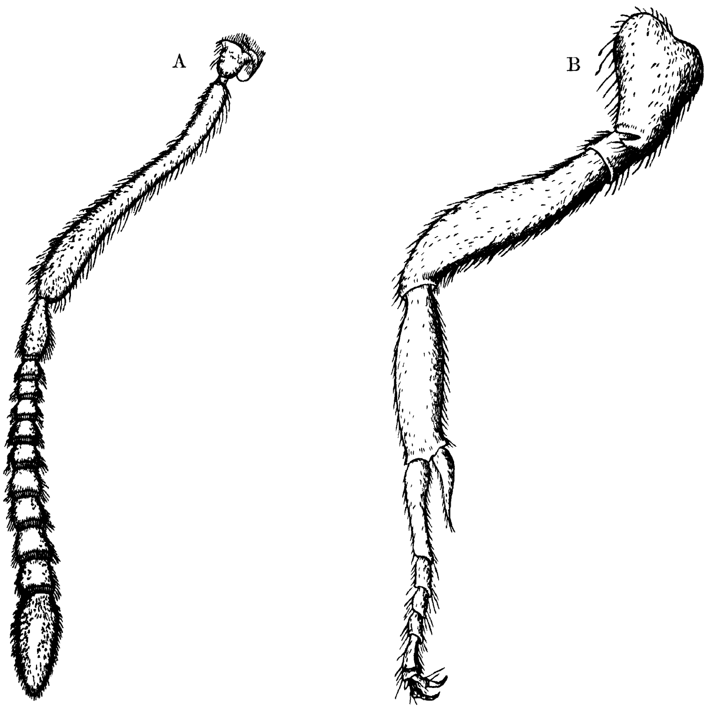

FIG. 8.—A, antenna of the Ant, magnified 25 times. B, leg, magnified 20 times.
(Drawn by Professor J. Cossar Ewart, Edinburgh, from a specimen of the House Ant, *Myrmica*.)

the microscope. These supply the main key to the actions we name instinctive, accounting so far for the persistence of instinctive activity, in contrast with periodic Instincts of birds, such as their migratory and nest-building propensities. This persistence of instinctive action is made still more impressive in the life of insects, on account of the distinction

of workers as neuters, the functions of reproduction being restricted to a comparatively small number.

Animal Instincts are associated with nerve-sensibility, and have their impulsive power stimulated thereby. Within the antennæ of the insects are concentrated many of the powers which, in other forms of life, are exhibited in structures such as eyes and hands. The structure further illustrates and explains the limitations which we remark in them, such as the lack of observation in passing by abundant material lying near at hand, and obstruction to fellow-workers when help is needed.

We are now ready for a survey of the mass of evidence from which a trustworthy generalisation may be reached. After the search for nutriment, the common Instinct in animal life is probably the sexual, providing for reproduction of species. This Instinct is periodic in action; it belongs to the human species, as to all animal life; among our animal impulses it chiefly requires the control of reason, meaning here, by this term, manifestation of such intelligence as makes account of general laws of conduct. This is peculiar to man, illustrating the distinctive relation of a rational nature to the impulsive forces of organic life.

Associated with the Sexual Instinct, there are in all cases Instincts directed towards care for the young. These appear in great variety of forms, according to the structure of the species and the conditions in which the young are reared. This is seen in insects depositing their eggs in places suitable for hatching; in the care exercised by the neuters among the ants; in the nest-building of birds; and in maternal care over the young shown by mammals. In this striking order of activity, periodic Instinct is closely connected with physiological conditions, and animal affection is strikingly manifested when the conditions are favourable. Unfavourable conditions lead to exceptional results. When grass is scarce, the ewe will drive off her lamb. 'The struggle for existence' goes against the weaker life. Under such test, animal affection is in the inverse ratio of human affection. The organic energy connected with the reproduction of life is greatly affected by diversity of temperature and other

adverse influences. External conditions, acting on the sensibilities of the parents, stimulate or lessen activity on behalf of offspring.

Variability in the manifestations of Instinct greatly favours Darwin's theory of descent by modification, and such variations are of frequent occurrence. Migration of birds is connected with this same Instinct, and its activity is largely determined by temperature. Quite apart from migration, though auxiliary to it, is the Instinct of direction, shown by many mammals, and specially by animals exercising power of flight, as in the return of bees to their hive, and in the flight of carrier-pigeons. Darwin has well said concerning 'the unknown power by which many animals can retain a true course,'[1] that 'the instinct which impels them to proceed in a certain direction ought to be distinguished from the unknown means by which they can tell one direction from another.'[2]

Instinct is seen at its best when it is not periodic, but is a continuously regulating power in daily activity. Such persistent action is most observed in Insects. Ants afford a striking example; their instinctive action in building and storing being singularly persistent and well under observation. Wonderful nerve-energy is connected with singular sensitiveness in the organs of touch, of grasp, and of movement. Their eager activity, and persistent gathering of building material, appear to show that they increase their hills without any other guide than the impulse to accumulate. They labour from morning to night, when weather and temperature favour; the amount accumulated depends largely on the season; the pile rises higher year by year, until, in Scotland, the heavy snows of winter crush it down. Nothing stays the energy of the colony. I have seen an ant-hill rudely broken up, its dome-shaped summit gone, great cavities in it, flanked by long rising slopes, and much of the laboriously-gathered material scattered in all directions around; yet the whole community was quietly and persistently at work, as before—all over the cavities the

[1] Darwin, 'Posthumous Essay on Instinct': Romanes' *Mental Evolution in Animals*, p. 359.

[2] *Ibid.* p. 356.

nurses appeared carrying out the eggs, while multitudes were bringing in fresh material, and that in complete disregard of the scattered materials around. Equally surprising illustrations of Instinct are found in the industry, and division of labour, visible in the bee-hive. 'No one will deny that the honeycomb is constructed with more art and care than the huts of many tribes of men.'[1] Weismann gives a striking illustration from the action of the gall-wasps (*Rhodites rosæ*) in depositing their eggs in the tissue of a young bud. The action of the mother is thus described: 'She first carefully examines the bud on all sides, and feels it with her legs and antennæ. Then she slowly inserts her long ovipositor between the closely rolled leaves of the bud; but if it does not reach exactly the right spot she will withdraw and re-insert it many times, until at length, when the proper place has been found, she will slowly bore deep into the very centre of the bud, so that the eggs will reach the exact spot, and here the necessary conditions for its development alone exist.'[2] It is clear from these observations that we must acknowledge the certainty 'that instincts are as important to an animal as their general correlated structures.'[3] When estimating the comparative value of Instinct, we must assign the most conspicuous place to insects, and I think the Ants rank first among them. I here reach a conclusion in harmony with Darwin's view, when he says that 'the brain of an ant is one of the most marvellous atoms of matter in the world, perhaps more so than the brain of a man.'[4]

Evidence seems to demonstrate that all Instinct is organic impulse,—an hereditary propensity, characteristic of species, adapted to environment, and confirmed by constant practice, but liable to variation, as the external conditions of life vary. It is a blind impulse, depending on vital energy, and liable to be modified as environment changes its demands.

So difficult is it to account for animal instinct, that we may

[1] Agassiz, *Outlines of Comparative Physiology*, par. 193.

[2] *Essays on Heredity*, p. 93; second ed., vol. i. p. 94. For additional examples, see Mivart's *Essays*, ii. p. 405, and Romanes' *Darwin and After Darwin*, p. 293.

[3] Darwin, *Origin of Species*, p. 192.

[4] Darwin, *Descent of Man*, p. 54.

well speak with Darwin of 'the unknown means' by which activity is directed; and may grant with him that it is 'difficult to conceive how animals . . . instinctively come to know a given period,' as that for migration. That the activity depends on hereditary sensibility and propensity seems clearly established. Nothing of the aptitude can be assigned to the experience of the individual worker; references to intelligence seem therefore unwarranted. The entire chapter on Instinct in Darwin's *Origin of Species*, must, I think, be read in an altered form, deleting the frequent references to 'mental faculties.' The need for a more rigid treatment of the phenomena of Instinct will become more obvious, by reference to the conflicting views upheld by naturalists. If we take the statement of Professor Claus, that instinctive actions '*apparently* are directed by conscious purpose,' these words can be interpreted only in the light of the further declaration, that 'Instinct may be rightly defined as a mechanism which works unconsciously, and is inherited with the organisation, and which, when set in motion by external or internal stimuli, leads to the performance of appropriate actions.'[1] Yet Claus, following on the lines of Darwin, when remarking on the brain of Insects, says that it 'seems to be the seat of the *will*, and of the *psychical activity*,' as if he were tracing observed functions. Herbert Spencer[2] suggests that instinctive action is probably accompanied by a 'rudimentary consciousness,' though the hypothesis is unsupported by evidence. When Professor Baldwin speaks of a 'low form of consciousness, which has not character enough to be impulsive,'[3] he admits that such consciousness, if it does exist, does not present itself to observation. The statement of Romanes is still more objectionable, when he says, 'Instinct is reflex action into which there is imported the element of consciousness,'[4] for reflex action is independent of consciousness, and Romanes has admitted that in our study of the sources of animal activity we are 'wholly re-

[1] Claus, *Text-Book of Zoology*: Sedgwick, vol. i. p. 94.
[2] Spencer, *Principles of Psychology*, chap. xii.
[3] Baldwin, *Text-Book of Psychology*: Feelings and Will, p. 308.
[4] Romanes, *Mental Evolution in Animals*, p. 159.

stricted to the objective method,' a method which cannot supply testimony as to consciousness. Accordingly, there is an inconsistency in defining Instinct as '*mental action* directed towards the accomplishment of adaptive movement, *antecedent to individual experience*, without necessary knowledge of the relation between the means employed and the ends attained.'[1] 'Mental action' 'antecedent to experience,' suggests a singular combination. If instinctive action is distinguished from action automatic and mechanical, as it requires to be, we must no less decidedly distinguish it from intelligent action, which proceeds on knowledge of the relation of means to ends. The main demand for scientific procedure is to discriminate carefully the evidence for Instinct from that revealing power of Intelligence, by reference to which such terms are introduced as 'mind,' 'reason,' and 'voluntary determination.'

In testing the hypothesis that Instinct and Intelligence are constantly associated, two methods are open to us. The first is to inquire whether Instinct, in any case, appears alone in animal life—that is, apart from Intelligence. The second is to discriminate Instinct from Intelligence, when the two co-operate in our own activity. We seek an exact account of both, as distinct phases of activity. Only thus can we escape from the present unsatisfactory treatment which commingles the two, leaving our conceptions in confusion, and favouring perplexing transitions from the one to the other. The need for a more exact understanding may be shown by reference to some of the striking cases referred to in Darwin's posthumous essay, published by Romanes.

In a passage treating of possible modifications of instinctive action, Darwin says: 'In all changes, whether from persecution or convenience, intelligence must come into play in some degree. The kitty-wren (*T. vulgaris*), which builds in various situations, usually makes its nest to match with surrounding objects (Macgillivray, vol. iii. p. 21); but this perhaps is instinct.'[2]

[1] Romanes, *Animal Intelligence*, pp. 15 and 16.

[2] Darwin, 'Posthumous Essay on Instinct': Romanes' *Mental Evolution in Animals*, p. 370.

Again, Darwin has said: 'It is true instinct which leads the Brent Goose to try to escape northwards; but how the bird distinguishes north and south, we know not. Nor do we know how a bird which starts in the night, as many do, to traverse the ocean, keeps its course as if provided with a compass. But we should be very cautious in attributing to migratory animals any capacity, in this respect, which we do not ourselves possess.' [1]

What is the animal capacity here? Multitudes of the most striking facts, carefully verified, show Instinct completely surpassing our power in directing our movements. In the case of animals so far apart as bees and birds, there appears the power to guide their flight unhesitatingly, and with an accuracy wonderful to us,—a power which must be referred to hereditary aptitude, not to experience. Such superiority helps considerably towards a more exact definition of animal Instinct, as an active force distinct from Intelligence. Instinct is animal impulse, an inherited propensity with attendant aptitude, appearing uniformly in the young of a species, and connected with special phases of sensibility; a propensity having no resemblance to that which depends on knowledge acquired by the individual through observation and experiment, or by training and habit. All observers agree in dissociating Instinct from 'experience.' To this, therefore, we must adhere. By 'consciousness' we mean knowledge of the contents of our experience. To attribute consciousness to animals is to grant to them a power of judgment, from which Instinct is excluded.

We can readily say with Herbert Spencer that Instinct is a 'compound reflex action,' for the action is not like that of a single organ of the body, but belongs to life-energy as a whole. We can further grant with Spencer that in the manifestation of Instinct 'a combination of impressions is followed by a combination of contractions'; but this merely expresses co-ordinated mechanism. Accepting the theory of Evolution, we can go further, and say that Instinct shows aptitude *acquired* by continued exercise of sensori-motor

[1] Darwin, 'Posthumous Essay on Instinct': Romanes' *Mental Evolution in Animals*, p. 357.

functions under conditions supplied by environment; and, thereafter, the transmission of such aptitude to offspring. But, when Spencer describes the action of acquired aptitudes as 'psychical states,' he goes beyond evidence as to the functions of animal structure. We are here delivered from the hypothesis of 'lapsed intelligence,' but we are involved in the inconsistency of unwarrantably importing Intelligence into animal activity. There is no evidence of even 'a low form of consciousness which has not character enough to become impulsive.' The impulse is both determinate and strong; the evidence for consciousness, even in a low form, is wanting. We are warranted in saying that the nerve-system, subject to external conditions, is capable of acquiring aptitudes, and that these can be transmitted to offspring. But when we suggest that the consciousness of man has some representation in the experience of animals, we draw unwarrantably on the functions of a higher life. There is indeed little wonder that we should do so in view of the marvels of Instinct, but we are, *ex hypothesi*, precluded from relying on such functions. We are therefore shut up to the conclusion, stated by Claus, that Instinct is 'a mechanism which works unconsciously, and is inherited with the organisation.'

Professor Lloyd Morgan, who has given much time to research in this field, says admirably: 'In addition to the vital activities, there is a vast body of more complex activities for the performance of which the animal brings with it innate capacities. Some of these, which we term "instinctive," are performed at once, and without any individual training.'[1]

That variations in environment are specially helpful to organic acquisitions, a large mass of evidence proves. Variations of season and of temperature, with illustrations of 'double instinct,' may be selected as specially valuable. Thus the example quoted by Darwin may be taken as suggestive. He says, 'The most curious case of a double instinct which I have met with is that of the *Sylvia cisticola* given by Dr. P. Savi (*Anns. des Sc. Nat.*, tome ii. p. 126). This bird, in Pisa, annually makes two nests; the autumnal nest

[1] Morgan, *Animal Life and Intelligence*, p. 415.

is formed by leaves being sewed together with spiders' webs, and the down of plants, and is placed in marshes; the vernal nest is placed in tufts of grass in corn-fields, and the leaves are not sewed together; but the sides are thicker, and very different materials are used.'[1]

Deviations from the common instinct of the species lend further help in working out a theory of the hereditary propensities. Thus Darwin remarks, 'If the nesting instinct varies ever so little, when a bird is placed under new conditions, and the variations can be inherited—of which there can be little doubt—their natural selection in the course of ages might modify and perfect to almost any degree the nest of a bird in comparison with that of its progenitors in long-past ages.'[2] Darwin has gathered an important group of observations of this class from Gould's *Birds of Australia*, and from the testimony of Réaumer and Bonnet, as given by Kirby and Spence in their *Introduction to Entomology*. 'The *Talegalla lathami* scrapes together a great pyramid, from two to four cart-loads in amount, of decaying vegetable matter; and in the middle it deposits its eggs. The eggs are hatched by the fermenting mass, the heat of which was estimated at 90° F., and the young birds scratch their way out of the mound. The accumulation propensity is so strong that a single unmated cock, confined in Sydney, annually collected an immense mass of vegetable matter.'[3] Again, 'Réaumer as well as Bonnet observed that ants ceased their laborious task of daily moving their eggs to and from the surface according to the heat of the sun, when they had built their nest between the two bee-hives, where a proper and equable temperature was provided.'[4]

Absence of Intelligence is often illustrated, in connection with high Instinct, as in the conduct of ants, already referred to, keeping to the beaten track in neglect of material quite at hand, and offering obstructions to fellow-workers. Similar evidence on the pages of Darwin becomes more striking because of the frequency of his references to Intelligence. For example, 'a jackdaw has been seen trying in vain to get

[1] 'Posthumous Essay on Instinct': Romanes' *Mental Evolution in Animals*, p. 371. [2] *Ibid.* p. 367. [3] *Ibid.* p. 367. [4] *Ibid.* p. 367.

a stick through a turret window and had not sense to draw it lengthways.'[1] An ant would never fail in this respect. Again, 'White (*Selborne*, Letter 6) describes four martins which year after year built their nest on an exposed wall, and year after year they were washed down. The *Furnarius cunicularius* in S. America makes a deep burrow in mud-banks for its nest; and I saw (*Journal of Researches*, p. 216) these little birds vainly burrowing numerous holes through mud walls, over which they were constantly flitting, without thus perceiving that the walls were not nearly thick enough for their nests.'[2]

Valuable confirmation of the view of animal Instinct here taken is obtained by discriminating Instinct from Intelligence in our own life experience, recognising with Wundt that 'the development of any sort of animal instinct is altogether impossible, unless there exists from the first that interaction of external stimulus with effective and voluntary response which constitutes the real nature of instinct at all stages of organic evolution.'[3] Wundt intends to insist on the 'voluntary' in this case, but the evidence drawn from the lower forms of life warrants nothing further than adaptation of motor response to sensory excitation.

Towards disposal of the questions here indicated, a general view of animal Instinct in man will be found to confirm the representations just made, regarding animal activity. The appetites concerned with nutrition and reproduction exist in the life of man exactly as in all animal life. The fundamental difference between man and the other animals appears in the rule of his life for the regulation and restraint of these appetites. Again, the Instinct of fear and that of self-defence appear in man just as in the animals. Both are, in our experience, independent of Intelligence, and only as the result of a later discipline are they brought under rational check. Fear, being a spontaneous excitement, is with difficulty placed under restraint. In self-defence, the phenomena are analogous, as when we throw out our arms to ward off threatened danger. The so-called 'art of self-

[1] 'Posthumous Essay on Instinct': Romanes' *Mental Evolution in Animals*, p. 370.

[2] *Ibid.* p. 371.

[3] *Lectures on Animal and Human Psychology*, p. 409.

defence' belongs to a different category. When we shrink from the disagreeable in odour, in colour, or in form, we are again within the region of spontaneity. The common law is clear, even though we allow for great diversities in individual sensitiveness.

Evidence will be found strikingly confirmatory if we contrast the spontaneous and the voluntary in our own actions, taking the phenomena of locomotion as connected with the laws of physical habit. In human history, organic development in the case of the individual, waits on the unfolding of Intelligence. The chick breaks open its shell with its beak, and comes forth to run about as if to the manner born. The child is powerless for such effort, its development is slow; and when sufficiently advanced to attempt maintaining equilibrium with locomotion, each step is a voluntary effort, —an experiment towards *acquiring* facility. But when the child has passed this stage, and locomotion has become as free as it is to the chick from the first, his will is no longer concerned with the management of each step. The organic structure proves equal to the task of sensori-motor activity, as the structure of lower orders is equal to it from the first.

Evidence multiplies on every side, as we observe the development of the Intelligence of the child. This is well shown in Professor Preyer's *Mind of the Child*. The use of language may be selected for illustration. There is an instinctive expression of emotions from the first, and this continues throughout, unless we 'school ourselves' in the art of concealment. This expression of emotion is a purely organic Instinct accounting for the early action of the infant, when crying, laughing, and crowing, and for the 'language' of facial expression and of gesticulation. Dr. Wylie has named these 'the expressive inarticulate sounds' natural to the human infant.[1] Darwin has remarked that the early stage of crying is not accompanied with shedding of tears. These manifest feeling depending upon a wider development of the sympathetic. There is, at a still later stage, as Wyllie has said,[2] 'a language in the very tones of a child's voice, and in the expression of its face,—a language inherited rather

[1] Wyllie, *Disorders of Speech*, p. 89. [2] *Ibid.*

than acquired.' When mind has begun to unfold, an effort is made to acquire articulate language. Here an admirable study is supplied of the relation between the voluntary and the instinctive. Slowly, by imitation and understanding, the child acquires words, making an effort to articulate. During this effort a special brain action is brought into play; the relations between individual purpose and vocal apparatus begin to be established, and this quite unconsciously, therefore, without any direction of the child's Intelligence on the means employed for vocalisation. Facility of utterance is gradually secured along with familiarity with vocables, and grammatical laws of construction. As voluntary direction abates, instinctive action is left in clear severance from the other, and it continues as a feature of spontaneous activity, until disease, or abating nerve-energy, discovers to us that our instinctive actions are being hampered. In this, and in many other relations, it is shown that 'movements which originally followed on simple or compound voluntary acts, have become wholly or partly mechanised.'[1] The translator's word 'mechanised' is not an accepted term in English, but it well expresses the fact that the voluntary precursor has disappeared, and that the whole energy is that belonging to organic apparatus. The dualism in human life, separating Intelligence from apparatus, is strikingly illustrated here; but I am concerned, for the present, only with the illustration of instinctive action in human life.

To guard against misunderstanding, it is needful to remind the reader that Darwin continually introduces references to mental faculties, in describing such action, while Wundt, Munsterberg, Claus, Romanes, and many others, speak of a voluntary element in this action. I describe it as purely instinctive and mechanical, inasmuch as it is executed without aid of sensibility in the brain, whence the stimulus is supplied. For interpretation of the term 'voluntary,' as used by physiologists, it is needful to add, that all motor activity beyond the movement of *a section* of organic apparatus—that is, all movement of the life as a whole—is commonly described as 'voluntary.'

[1] Wundt, *Lectures on Human and Animal Psychology*, trans., p. 388.

The flaw in our modern scientific methods is that phenomena, which belong only to our conscious life are imported into our observations of animal activity. This addition seems so natural, and so thoroughly warranted by our own experience, that we feel no check upon its introduction. The source of not a few of our perplexities is thus within ourselves. It is in this way we are hindered from attaining clear observations as to the possible action of organic structure. Using a coloured transparency, we fall into the mistake of attributing to the object the colour belonging to the medium.

This common tendency appears very strikingly in Schneider's 'analysis,' when professing to find how much is involved in a complex instinctive action. Thus, speaking of the propensity of the corn-storing mouse, the Hamster, he says, 'If we analyse the propensity of storing, we find that it consists of three impulses. First, an impulse to *pick up* the nutritious object, due to perception; second, an impulse to *carry it off* into the dwelling-place, due to the *idea* of this latter; and third, an impulse to lay it down there, due to the *sight* of the place.'[1] I am unable to concur with Professor James[2] in his admiration of this passage. It seems to me an analysis of our modes of accounting for what is done, and not a product of scientific observation. Schneider is speaking of an animal belonging to an order in which are included many forms transitional to the insectivora. The Hamster stores corn in its hole, just as ants store it in their formicary.[3] The common wood ant of Scotland (*Formica rufa*) gathers beetles, flies, and wasps into the ant-hill. This propensity remains unexplained, Schneider's analysis helping nothing. It is indeed agreeable to learn that 'it lies in the nature of the Hamster to do so,' but nothing is gained beyond describing 'hereditary propensity.' This propensity seems nothing more than an expansion of the common tendency to run off with food. It may be reasonable to speak of impulse, but to speak of 'perception' and of 'idea' is unwarranted by the

[1] *Der Thierische Wille*, p. 208, quoted by Professor James: *Principles of Psychology*, ii. p. 385. [2] *Principles of Psychology*, vol. ii. p. 385.

[3] M'Cook, *Agricultural Ant of Texas*.

facts observed. Darwin's words, when treating of migration, are truer to our observations: 'difficult though it may be to conceive how animals, either intelligently or instinctively, come to know a given period,' yet a 'migratory instinct' has been acquired. Reference to impressions made on organism by environment, inducing 'innate aptitude,' awakening vital impulse, is a more probable account of the genesis of Instinct, than that bees, ants, and mice, carry about with them 'an idea' of their dwelling-place. Schneider keeps more closely to observation when he says that 'it would be very simple-minded to suppose that bees follow their queen, and protect her, and care for her, because they are aware that without her the hive would become extinct.'[1] The action of bees far more favours the reference to Intelligence, than the action of the hamster. I have watched very closely the action of ants in gathering stores, and it seems quite apparent that a common impulse moves the workers on their crowded highway,—a highway more definitely marked out than any mouse's track. In good weather, these ants continue storing as long as the day lasts. They 'strike' only in rain and cold, showing no aversion to work, but a strong impulse towards accumulation. Having regard to the sensibilities and impulses of the animals, there is nothing in the history of their action to suggest the presence of a 'train of ideas.'

The mass of observations at command point to the conclusion that Instinct is an acquired Organic Impulse, induced by struggle for adaptation to environment, and transmitted under the laws of heredity. That instinctive impulse comes from long-continued impressions on nerve structure by external conditions, is a hypothesis harmonising with the theory of Evolution.

In view of the illustrations of animal Instinct now considered, it appears that Nature makes *fixed* provision in structure and function for necessary work, rendering the doing of such work *easy* under force of persistent, or of recurring, animal impulse.

[1] *Der Thierische Wille*, p. 187.

CHAPTER VII

ANIMAL INTELLIGENCE

THE distinction between the phenomena of Instinct and those of Intelligence, as both appear in animal life, is commonly admitted. We are not, however, without risk of confounding the two; such confusion is not infrequent in scientific treatises. The contrast, however, remains an acknowledged one, as appears in the observations and discussions of all naturalists. This distinction I desire to trace, by investigation of such evidence as may warrant a scientific conclusion. Hitherto, the whole animal kingdom has been contemplated; we are now to consider characteristics attributed to only a limited number of animals. By common consent, reference is here specially made to the higher mammals. Thus Darwin says, 'My object is to show that there is no fundamental difference between man and the higher mammals in their mental faculties.'[1]

We have seen that *all activity* of animal life is, in its character, selective and purposive. The animal, by sensibility, discriminates between materials; under impulse of appetite, appropriates what is nutritive. Beyond this, we have traced, in the actions of distinct species, several phases of Instinct. We proceed now to consider the evidence of Intelligence amongst the higher mammals, and next, the scientific account to be given of its appearance in Nature. We here pass beyond the field of Organic Impulse, springing from inherited aptitude of structure, into another where knowledge is gathered, and is applied in guidance of action. These two sets of phenomena are so different that it is comparatively easy to keep them distinct when attention has

[1] Darwin, *Descent of Man*, p. 66.

been directed to the contrast. Virchow has said, that 'it is difficult or impossible to draw the line between instinctive action and reflex action'; but it is quite otherwise with the contrast between Instinct and Intelligence. When observing an animal, we may, indeed, find it difficult to decide whether its action is purely Instinctive, or presupposes a measure of Intelligence. This difficulty arises from the inadequacy of possible observations. This obviously is the explanation of the remark made by Romanes that 'no distinct line can be drawn between instinct and reason.'[1] It is certainly difficult in many cases to determine how much is to be assigned to Instinct, how much to Intelligence; but when separate phenomena are placed before us in contrast—let us say, on the one hand, nest-building, on the other, the work of the dog in helping a shepherd in the management of his flock—it is easy to see how Instinct and Intelligence differ, for Instinct is a natural impulse, direct as appetite, and analogous to it: Intelligence implies some gathering of experience, and use of knowledge acquired, and some training in its application. Impulse is immediate and directly effective; knowledge is immediately *received* but only mediately effective, for if its relation to activity is seen with experience of an impulse (which may be mainly animal), the direction of impulse depends upon knowledge superadded to the physical energy and instinct. The contrast is in many ways familiar in our own life. I instinctively start when a shot is unexpectedly fired, close by; I intelligently prefer one of several tracks in the forest, because I notice that this one inclines towards my destination.

When this contrast is explicitly stated, we face a new problem arising out of the superior activity of the higher mammals. Intellectual or psychical phenomena appear in their activity, placing the higher mammals in closer relation with man. When animal and human life are compared, two distinct phases of Intelligence appear, the lower common to both, a Perceptive Intelligence concerned with facts and their relations; a higher Reflective Intelligence, carrying through a process of inference, and making account of

[1] Romanes, *Animal Intelligence*, p. 15.

general principles and rules of conduct, with whatever additional powers of mind may be presupposed in exercise of 'Reason'[1] as in its nature superior to Observation.

We are here concerned directly with the phenomena of 'Animal Intelligence,' as these appear in contrast with the phenomena of Instinct, which have just engaged attention. Appreciation of the distinctive features of the phenomena of Intelligence is the first requisite. The higher animals are structurally nearer to us; but besides this, selected species come into close relation with us in our work. This introduces a marked difference in animal life,—an accession of power—warranting reference to Intelligence, as distinct from Instinct. To animals in a state of nature, there may belong powers that have not, as yet, been observed by us; but constant observation of domesticated animals renders our estimate of their powers quite reliable. We depend upon well-ascertained and quite familiar facts, when we regard a certain number of their actions as superior to instinctive actions. We have trained these animals to our service, finding that they could understand us, and could, in this way, help us in our work. In default of this higher aptitude, they could render no more service than lower orders of life. The dog and the horse interpret our signs. Our words are not addressed to them in vain. Our dog will fetch an article

[1] I thus use the term 'Reason' as the name for an Intellectual power, superior not only to Sensibility, as that is characteristic of all nerve structure, but also to perception and understanding of visible signs, artificially connected with direction of conduct, as in the life of the dog. 'Reason' in its wider sense, in which it is a distinctive mark of human life, indicates comparison, judgment, and inference resting on general conceptions. This is the meaning popularly recognised, when it is said that Reason is the gift of man. It is a gift superior to the 'perceptive intelligence' which gives knowledge of facts and relations. Kant's use of Reason, as designating a power recognising first principles and 'ideas' given in mind, is of the highest philosophic importance; but this usage may be restricted to Philosophy. Mr. Benjamin Kidd, in *Social Evolution*, uses Reason to particularise 'Scientific Reasoning,' the process of scientific induction, depending on exact scientific observations. This use of the term is special, apart from the popular usage which marks by the term Reason only ordinary reasoning. If, however, Mr. Kidd's definition be accepted and adhered to, his main contention is correct, that Social Evolution is not the product of scientific methods.

desired; a horse will turn to left or right, according to the word of his driver; yet these animals cannot understand as a child does; their range of knowledge being very restricted. Nevertheless, by training they know enough of the significance of our movements, gestures, tones, and words, to be guided by them in such action as is natural to them as animals. How important all this is in practice is apparent if we consider how the shepherd is placed without his dog, and how it fares with the woodman in securing cut timber, if he cannot have the co-operation of the horse or the ox; or how conditions of traffic would be limited, if the muscular force of these animals were not at our command by their intelligence and docility. It is unnecessary here to include a wider range of observations as to the elephant, the camel, and, even with the serious reservations needful, the ape. Whatever the intelligence of the monkey and ape may be, these animals are of less account to us, because, so far as our knowledge goes at present, they are, it may be by temperament, less capable of training. These collateral ranges of observation I have dealt with in *The Relations of Mind and Brain*, chap. vii. By concentrating on the dog and horse, we secure a definite and manageable class of phenomena. Their intelligence is undisputed; and its range is certainly equal to anything which can be assigned to other mammals. The observations of Professor Garner as to 'the speech of monkeys' have not resulted in any important addition to the evidence already at command. It seemed at first as if some trace of higher powers had been found; but the visit to the African forest, with the aid of the phonograph, has not added to our knowledge anything of essential importance bearing on our present argument. The so-called 'speech' of the monkeys does not prove to be greatly in advance of vocal communications by other species. It is familiar to us in the case of birds and higher animals; they emit sounds when they are surprised or alarmed; and other sounds, distinct in tone, when they are pleased or attracted. The speech of monkeys does not seem to show a much wider range, the sounds emitted, so far as yet appears, not expressing more than common phases of animal

feeling. Nor does the work of monkeys and apes, in their natural habitat, suggest much that is noteworthy. Darwin remarks that 'the anthropomorphous apes, guided probably by instinct, build for themselves temporary platforms.'[1] But these temporary platforms admit of no comparison with the structural skill of birds in nest-building; and if the latter be referred to Instinct, much more may the former.

Observations of animal activity further show that Instinct *may be improved*, as the demands upon it increase, and full value must here be given to this admission. It is, however, doubtful if Darwin's suggestion can be accepted, when he proceeds to say that 'as many instincts are largely controlled *by reason*, the simpler ones, such as this of building a platform, might readily pass into a voluntary and conscious act.'[2] The restriction in this relation to simpler instincts is peculiar, tending in an unexpected direction. It seems to imply that anthropoid apes might ultimately advance towards the skill of birds, and thereby approximate to human intelligence. This mixture seems to threaten serious confusion of biological relations. We may be well assured that we are not leaving behind us, on lower biological levels, more valuable phenomena in proof of Animal Intelligence than those in the life of the monkey and ape. On the other hand, when we concentrate on the activity of the dog and the horse, we have unquestionably before us quite the highest manifestations of Intelligence among animals.

The study of Animal Intelligence is, in our day, seriously affected by conclusions accepted under a theory of Evolution. Admitting Intelligence in the dog and horse, the scientific problem is how to account for the appearance of this higher power. Can we continue, as hitherto, to refer these phenomena to some visible advance of structure, thus finding in them a further illustration of the Evolution of Life? The difficulty of this hypothesis has not as yet been fully realised. The question is really this—Can cosmic law, as traced in the action of environment on organic structure, account for the appearance of animal intelligence? Such a claim is quite

[1] Darwin, *Descent of Man*, p. 82.

[2] *Ibid.*

novel, suggesting, as Romanes has said, the 'probable evolution of mind from non-mental antecedents.'[1] If these 'mental phenomena' can be shown to depend on structure, there is no novelty. If the phenomena are distinct, it is quite otherwise; and the theory of Evolution here touches a difficulty not encountered at any previous stage. We are now proceeding under the distinct acknowledgment that mental phenomena are distinct from physical, that the functions of Intelligence are different from organic functions. This is implied in the recognition of '*Animal Intelligence*.' If these two sets of phenomena are not homologous, the theory of Organic Evolution has reached its limit. Some new power has appeared in Nature, giving to organism a wider range of activity than is possible, when it is dominated only by an elaborate brain structure, and by impulses which are Instinctive. Judging of things as we do from the standpoint of human history, we perceive that this additional power places the higher mammals within a kingdom of Intelligence, assigning to them an efficient, though subordinate, part in the unfolding of human civilisation. For the appearance of this new power, it is impossible to find an explanation in the combined forces of organic life and environment. We have reached a point in the history of life at which the Spiritual Power beyond Nature is manifesting anew its presence in the origin of a higher phase of activity. Under a theory of Evolution, the agency of this invisible power has been implied from the first, for the energies of Organic Life require explanation beyond themselves,—an explanation found only in an Intelligent First Cause. It is therefore in nowise strange here, or alien to our process of thought in accepting a theory of Evolution of organic life, that we now mark a new order of phenomena, affording further testimony to the agency of a spiritual power in Nature, even though such a power be, as all admit, beyond the range of scientific observation. If the scientist here proclaim himself an agnostic, as Huxley did, he proclaims only the limits of science, nothing more; for nothing can diminish the high significance of this new biological phenomenon,—the appear-

[1] Romanes, *Animal Intelligence*, p. 5.

ance of Intelligence. The significance of the fact will be still more apparent when we advance to the higher levels of human psychology. For the present, we work on a lower level, being content to concentrate our observation on the facts as they appear in natural perspective. We deal with Intelligence of an order inferior to our own; and, *ex hypothesi*, appearing in the world at an *earlier* period in its history. For scientific results it is preferable to study Animal Intelligence at its highest level, when its possibilities have been made more manifest by its association with the activity of man. The dog and the horse supply us with the best illustrations; our familiarity with their co-operation enables us to reason with more assurance of accuracy, while the figure of the Brain will show motor centres.

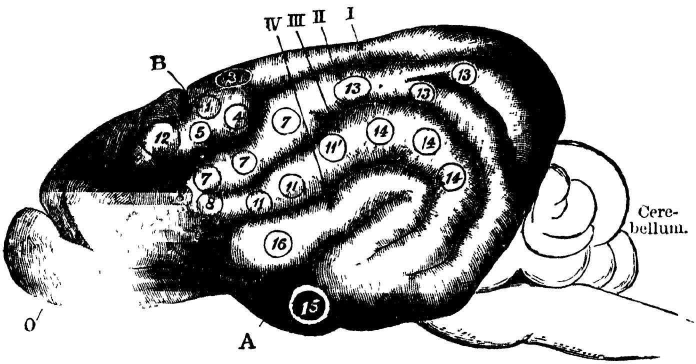

FIG 9.—Brain of the Dog—left hemisphere.

(*From* Ferrier's *Functions of the Brain.*)

'Left hemisphere of the brain of dog. A. The fissure of Sylvius. B. The crucial sulcus. O. The olfactory bulb. I, II, III, IV indicate the first, second, third, and fourth external convolutions respectively. 5. Movements of fore limb 1. Hind limb. 7. Of Mouth. 14. Pricking of ear. 15. Twisting of nostril. All these provide for movement on *opposite* side of the body.'

With a definite test, our statements of fact become more exact. The phenomena of Animal Intelligence are in advance of all phases of activity at an earlier stage. On the lowest levels are the forms of activity immediately responsive to outward stimuli. There is next rhythmic action, sustained by a co-ordinated nerve system, as in the medusæ. In advance of this, there is instinctive action,

at its best in certain Insects, but characteristic of animal life generally, even of the higher orders. Above all these are the phenomena of Intelligence, beyond the sphere of Organic Impulse, yet essentially associated with organism. Still, beyond this, appearing in human life, there is 'Rational Power,' which cannot be attributed even to the higher mammals.

In concentrating now on the Intelligence of the Dog, we have to record, as a preliminary observation, that the animal

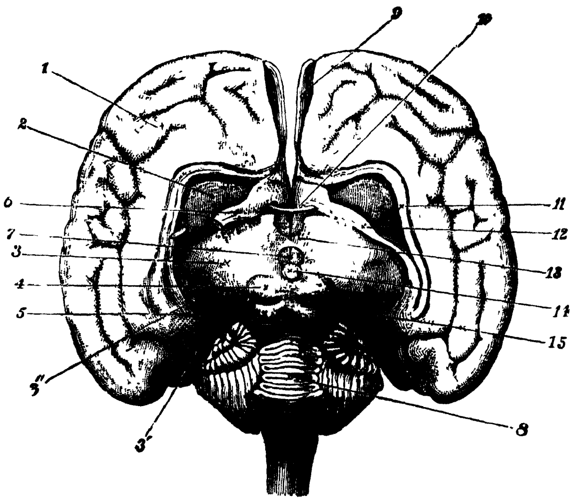

FIG. 10.—Internal structure of the Dog's brain.
(*From* Ferrier's *Functions of the Brain.*)

'The Cerebral Hemispheres of the Dog separated after Division of the Corpus Callosum, so as to expose the Ventricles and Basal Ganglia. 1. The internal surface of the left hemisphere. 2. The corpus striatum. 3. The optic thalamus. 4. The anterior tubercles of the corpora quadrigemina. 5. The posterior tubercles. 6. The anterior pillar of the fornix, which is divided on the left, undivided on the right side (12). 7. The third ventricle, exposed by drawing the optic thalami asunder 8. The upper surface of the cerebellum. 9. The olfactory bulb or rhinencephalon. 10. The anterior commissure. 11. The corpus callosum divided. 12 Fornix undivided. 13. The soft commissure. 14. The pineal body, situated over and concealing the posterior commissure. 15. The descending cornu of the lateral ventricle.'

is structurally superior to man in respect of olfactory apparatus, for there lies in front of the dog's brain (and of the horse's, and of the brain of many other animals) a large bulb of smell, communicating with the base of the brain by means of a strong nerve-tract. (Fig. 9, o.)

The human Brain, though superior in most respects, has not an olfactory apparatus to compare with this. To the animal belongs higher sensibility to the stimuli of odours, giving to it an intensity of experience in this form, impossible to us. The 'mental phenomena' appearing in the activity of the dog have, however, no explanation in this way. The animal's power to interpret our signs, to co-operate with us in work, and to profit by training, are the phenomena we designate 'mental,' *i.e.* non-physical; they are psychical phenomena, which, as we shall see, are not traceable to structure either in any of its parts, or in its central organ. The sensibilities of the animal, no doubt, co-operate with its interpretation of our signs. There can be no abstracting of the phenomena of Intelligence from those of sensibility. The life-energy of the animal, the power of vision, all forms of nerve-sensibility, and all the pleasure the animal feels in the chase, must be taken along with the phenomena on which we now concentrate. These combinations, however, must not be allowed to confuse our observations as to Animal Intelligence. This animal has a power making it capable of so far understanding us, that we can transfer from our consciousness to its Intelligence, appreciation of our purpose, securing co-operation with us in effort. All this is well illustrated in the case of the sheep-dog (Scotch collie), the companion and helper of man, saving him miles of climbing, when the flock is to be gathered from the hillside. When a wider range of work is to be done, it is enough for the animal to have a signal from his master, when he is standing far beneath, at such distance that vocal direction is scarcely available.

The initiation and guidance of all these actions belong to man. When the animal is left altogether to itself, external stimuli play the chief part, and consequently it is readily turned aside to any allurement, by simple direction of smell. The habits of the life are then moulded in accordance with its sensibilities, the manifestation of Intelligence being slight and fitful. The dog's Intelligence appears more conspicuously after a certain degree of guidance and training. Such experience makes its impress on organism,

originating new sets of habits, capable of being readily set in motion, not only by the familiar voice of his master, but even by these susceptibilities of the animal. These gleams of Intelligence are sufficient to make training effective, but they are not such as to suggest independent direction of conduct, by reflective exercise.

When we inquire as to the *genesis* of Animal Intelligence, we must deal with an early stage of natural history, antecedent to the advent of man. We must, therefore, withdraw from view everything in animal training depending on human intervention. This doubtless is to remove from the sphere of observation a large and important mass of the phenomena described. If man's guidance disappears, with it are withdrawn from view all the important results of domestication and training. The Evolution Theory, however, expressly requires this deduction, in order to trace the conditions of historic advance. Evolution is progression from lower to higher structure and functions. Under the hypothesis, deviation from this line is impossible, because, *ex hypothesi*, unhistoric. The higher mammals must, therefore, be regarded as antecedent to man. Their Intelligence must be explained by cosmic law alone, operating upon antecedent life. Can we, then, maintain as probable, the evolution of animal intelligence 'from non-mental antecedents'?[1] There is no evidence for such a hypothesis.

Admitting Animal Intelligence, we seem led directly to the admission that *a new power* has appeared in Nature. On the unanimous testimony of naturalists, as well as on evidence of common observation, Intelligence is assigned to the higher mammals. Can the phenomena of 'Animal Intelligence' be explained from a physiological basis? Could such an argument be supported by reference to the lower orders of life, by reference, for example, to the rodents as a class, or, to specialise, by reference to the rabbit, an animal with whose habits and powers we are fairly familiar, having at command the evidence of domestication?

The functions of the brain supply here the first available

[1] Romanes, *Animal Intelligence*, p. 5.

area of observation. The brain generates and supplies to the nerves of the sensori-motor system the energy without which both sensibility and muscular effort would be impossible. The Brain is further the centre of activity equally to the simpler organism, such as that of the fish, and to the more complex, endowed with elaborate special senses, and intricate muscular arrangements, such as that of the dog. Advance of organism and advance of brain structure invariably keep pace with each other. Interpretation of the functions of this central organ must be according to the manifestations of activity in the afferent and efferent nerves, and in the muscular system, and in the general activity of animal life. This relation of brain energy to organic activity is observed from the first appearance of a nerve-centre. The results of electric excitation of the surface of the brain, as shown by Ferrier (Figs. p. 88 and p. 286), and sustained by all later observers, confirms the conclusion that brain energy accomplishes the whole round of Organic Activity.[1] Within the sphere of physiology, structure and functions are equivalent; all forms of activity must be referred to this organic source in sensory corpuscles, nerves, nerve-centre, and muscles.

To those who deny the existence of mind, as distinct from brain, there is no alternative save the attempt to show that the so-called 'mental phenomena' can be assigned to well-defined circles within the brain, and are in reality 'physical phenomena,' capable of being explained under physiological law. The various attempts to demonstrate this are not being attended with success. We are, indeed, told that all activity can be traced from the egg onwards, but we are not shown how the mental phenomena are accounted for in the history of organic life.

To those who hold that 'Mind' is a distinct phase of life, implying a new start in biological history, there is no perplexity in the admission that its outward manifestation can be accomplished only through the central organ of the body. The outward manifestation of mind is always,

[1] Ferrier, *Functions of the Brain.* I have given an outline of results, with illustrations, in *The Relations of Mind and Brain.*

and only, by physical activity, sensory or motor. When the physical energy of an animal accomplishes an ènd quite beyond organic movement, and outside the field of desire and instinct, we must seek the explanation *beyond* the central organ. Such an end is accomplished in the activity of the collie, by the aid rendered to the shepherd involving a wider efficiency than appears within bodily movement. On this ground, we attribute 'mind' to the dog, though, on the evidence, we are unable to trace the presence of rational power. In the action of Instinct,—where the end of purposive action outstretches the life of the agent, being concerned with the good of offspring—the impulse is from the organism itself, as the activity is wholly organic. The *sensible end* is limited to the action and attendant experience of organism; the purpose of the action,—the end in biological history,—is quite beyond such experience. The animal satisfies only its own impulse. It is different when there is an intelligent purpose to be served, and when we find it possible to direct animal activity by intelligible signs, without use of which there would be no co-operation with us in the accomplishment of our designs.

To make the advanced position clear, we need to concentrate on animal *experience*, connected with that class of efforts enumerated as illustrating 'Intelligent Activity.' We have seen that all organic action, even that observed in a cell, or in a jelly-fish, is selective and purposive; yet we do not trace 'mental phenomena' in the life of lower forms. When, with more advanced organism, we observe the action of Instinct, it is the action of blind impulse, accomplishing surprising results, without knowledge of the end afterwards to appear. In these actions we do not recognise 'mental phenomena.' It is only when we advance to the higher mammals, seeing them understand the relation of means to ends, that we trace a new power at work, and feel warranted in speaking of animal intelligence.

With this threefold distinction before us, we must give prominence to the general truth that all organic activity, from that of the lowest to that of the highest order, implies a *sensitive experience,* under which there is uniform provision for organic gain, involving structural and functional advance.

The biological significance of this is the evolution of organism. The general law, which Darwin has made conspicuous, must not be obscured by our references to the Intelligence which appears amongst the higher mammals. Whatever be the distinct functions of Intelligence, and whatever the results secured by its appearance, the common laws of sensible experience, and of organic acquisition are quite distinct, being equally applicable to orders low in the scale of life, and to the higher orders. The whole round of animal activity is selective and purposive; only when we reach the higher mammals do we discover that a portion of this action is intelligently done.

In accordance with the laws of organic life, Romanes accurately says, 'that an oyster profits by individual experience.'[1] But when he speaks of the oyster 'displaying Intelligence,' alleging that the oyster 'is able to *perceive* new relations, and suitably to act upon the result of its *perceptions*,' he interpolates functions which have not been observed. He is describing what an intelligent being does; what, for example, *we* should do in like circumstances, he is unwarrantably attributing to the oyster our conscious activity. Equally within the oyster and within human organism sense-organs provide for experience being gained by other and shorter methods than those of Intelligence. Science still needs a truer estimate of animal sensibility here, and of the potentiality vested in it. There is nothing which more urgently calls for readjustment, in order to secure exact records of observations, than the present view of the possibilities of *experience* amongst the lower forms of animal life. Oyster-sensibility is capable of effecting action under varying temperatures, under the silting of sand by currents, and the approach of enemies; but there is no Intelligence in such action; for there is no animal whose experience does not provide for accomplishment of such activity. This is the lesson impressed on us by the conditions of 'individual experience' in the oyster. The fact that 'organism profits by individual experience' supplies no analogy with the action of Intelligence in interpreting signs and in gathering lessons

[1] Romanes, *Animal Intelligence*, p. 14.

from the past, as to the adaptation of means to ends, and in afterwards applying these for the guidance of conduct.

On these grounds, the position of Romanes must be challenged when he defines Instinct as 'mental action.'[1] Admitting 'the uniformity of instinctive action as performed by different individuals of the same species,' he says we may 'define Instinct as mental action (whether in animals or human beings) directed towards the accomplishing of adaptive movement, antecedent to individual experience, without necessary knowledge of the relation between the means employed and the ends attained, but similarly performed under the same appropriate circumstances by all the individuals of the same species.'[2] Excluding the representation of mental action, the definition is in harmony with observation; but in animal action, even the most striking phase of Instinct, in absence of the 'knowledge of the relation of means employed and ends attained,' does not indicate the presence of any 'mental constituent.' Instead of doing so, its testimony is adverse to the author's contention, the definition, apart from its reference to 'mental action,' being equally applicable to protozoa and mammals. When instinctive action is said to be 'similarly performed by all the individuals of the same species,' this is indirectly to witness for the *absence of Intelligence*, inasmuch as it points to organic adaptation, hereditarily transmitted, not to the understanding of relations. But we do find a 'mental constituent' when we contemplate the training of the collie. Such training—if we mark the difference between taming and training—affords an effective test of the contrast between Instinct and Intelligence. If the sensibility and motor activity of *every* animal secure that it profits by individual experience, we can readily, by experiment, ascertain whether higher powers belong to the animal, rendering it capable of being trained to co-operate with man. The highest manifestations of Instinct, as seen in insect life, reveal a marvellous power which cannot be turned to account in our service. But when our experiments are restricted to the higher mammals, there is *a fellowship* between man

[1] Romanes, *Animal Intelligence*, p. 15. [2] *Ibid.* p. 15.

and the animal. Possibility of training thus becomes a reliable test of the possession of Intelligence.

Some discrimination is, however, required in the application of the term 'training.' The experiments of Sir John Lubbock[1] have shown that the ant can be trained to go in certain routes for supplies of food deposited in a position to be reached only by these. But the training of a dog gives results far beyond anything involved in these experiments. The possibilities of 'training' thus become a valuable test of aptitudes belonging to animals. We are familiar with exhibitions of 'educated animals.' We have educated fleas, and birds, and hares, for Cowper's hares have become familiar to admirers of the poet; but, when we contemplate 'training,' such as is possible in the case of dogs and horses, we are on a higher platform, showing two distinct sets of results. On the one hand, there is training which relies on nerve-sensibility and instincts; on the other, there is training which depends on these, and besides on intelligent appreciation of our signs. With the lower orders of animals, we depend upon sensibilities, appetites, and instincts. With his educated fleas the exhibitor relies on the sensori-motor system of the insect. By slight friction applied to the extremities, inducing activity, he has ingeniously harnessed the energy of insect life, procuring mechanical action, which he turns to account. For such training, intelligent appreciation of the exhibitor's design is not required. This is 'training' of a kind, but of a phase so low that the operator is well aware of his dependence on vital mechanism. It is very different when we deal with the higher mammals. Lower possibilities are now associated with higher. These two classes of results show the severance between structural sensibility and Intelligence. We train a dog to sit up, while a piece of biscuit is placed on his nose, and to remain in this attitude, until a clap of our hands gives a signal for catching the morsel in his mouth. This is a case of restrained appetite, resulting from patient efforts to establish a habit. When, however, the dog co-operates with the shepherd in gathering the flock, obeying his call, and interpreting his signals, training depended on

[1] Lubbock, *Ants, Bees, and Wasps.*

Intelligence. When the horse is yoked to the conveyance, we have only harnessed available horse-power. The animal drags his load in accordance with habits we have induced. In this we are, no doubt, aided by hereditary tendency imprinted on the species. No Intelligence is manifested in these results. So it is, largely, with training in the circus, where the animal's course is mechanically restricted, whip and voice playing on his sensibilities, the trainer showing his own Intelligence in not pressing the animal beyond well-defined limits of capability and temper. When, however, the horse answers to the commands addressed to him, as in the road, in the field, and in the drill ground, we have a higher type of results affording evidence of Intelligence.

In comparing the lower mammals with the higher, the contrast seems fairly presented when, selecting from the rodents, we take the rabbit for comparison with the dog. The analogy in Brain is as close as can be, between a simpler and more complex form of like order. There is in both the same prominence of olfactory bulb and strand, assigning to sense of smell a large part in the guidance of activity. Otherwise, there is the difference between the smooth and more convoluted Brain, marking organic advance in the dog. It is when observation is directed on the habits of these two animals, and on the phases of their activity, that we are able to describe more accurately the difference of power possessed. The contrast then appears in the phenomena of Intelligence, when the dog understands our signs, and takes guidance from them, whereas we seek in vain so to teach and train the rabbit, as to bring it into sympathy with our plans.

The mental power recognised in the higher mammals is, however, greatly inferior to that belonging to man. The sense of this is constantly present to us, in the midst of all our experiments. Such education as is applicable to animals, lower and higher, is, however, applicable to man in so far as he shares an animal nature. He, too, is trained in physical aptitudes by use of physical sensibility; he, too, is guided in activity by interpretation of signs such as the Intelligence of the higher mammals can recognise. Experience,

common to animals and man, ends here. Animals have no part in 'education' such as that provided for children, which makes a demand upon reflective power, sustained by self-directed observation. Still more are the higher mammals debarred from attainment of a reasoned knowledge, in acquisition of which men share the benefits of 'scientific education.' In view of this contrast we conclude that *prima facie* evidence is against the hypothesis that human Intelligence illustrates evolution from a lower to a higher phase of Intelligence.

We do not, in this conclusion, undervalue Animal Intelligence. Admitting the appearance of mental phenomena, it seems clear that the Intelligence of the dog has not its genesis, either in the sensibilities of organic life, or in powers of Instinct. In noting with Darwin, that 'the fewness and the comparative simplicity of the instincts in the higher animals are remarkable, in contrast with those of the lower animals,'[1] we receive Nature's lesson, teaching us that Instinct is not the potentiality from which Intelligence springs. We remark in the life of the higher mammals the disappearance of the more complex instincts. This is accounted for by restriction in their life of certain forms of sensibility by disappearance of elaborate structure such as belongs, for example, to insects and crustacea. On the other hand, the novel feature in the life of the higher mammals is, that they interpret our signs, and, by this means, have their activity directed into new channels, accomplishing results unattainable by Instinct. Such activity is quite different from the ordinary efforts of these animals to secure satisfaction of animal wants. If this be apparent, it follows that 'careful study of domesticated animals' yields no aid towards explanation by the action of cosmic laws on organic life, for the appearance of Intelligence, even in its *lower* phase.

This conclusion will be further tested when we proceed, by and by, to consider Human Intelligence. For the present, we are concerned with a clear understanding of such Intelligence as can be assigned to the higher mammals. Evidence shows that their Intelligence is capable of being guided by ours;

[1] Darwin, *Descent of Man*, p. 67.

they have a Perceptive Intelligence, while they give no signs of having at command a Reflective Intelligence such as men possess. The action of the higher mammals, however, is quite above the activity of lower orders of life, even of those in whose life instinctive action is superior to that of the mammals. The lowest life is, as we have seen, capable of selective and purposive action, but only of such as is dependent exclusively on organic sensibility. Above this, animal life shows the results of evolution of structure in higher phases of selective and purposive action, possible to 'an organised being whose life is made what it is, by so many instincts, of which he neither knows the origin, nor understands the exact significance.'[1] The life of the higher mammals shows further advance in selective and purposive action, by perception of differences and of relations, under guidance of man, and by interpretation of a limited range of his signs, applicable to their natural impulses. It is to this higher action that the words of Romanes are applicable, to which we have objected as they appear in his definition of Instinct. It is here, for the first time, we find a 'mental constituent.' Only of 'mental action' (whether in animals or human beings) or of physical action directed by it, can we say that it is directed towards the accomplishing of adaptive movement with some degree of 'knowledge of the relation between the means employed and the ends attained.'[2]

Here we touch the limit of descent by modification, passing beyond the lines of organic evolution, to find an accession of power in the history of animal activity. It is true, that in discovering Intelligence in the higher mammals, we depend upon use of our own Higher Intelligence; but this holds only as in our recognition of all scientific truth. Animal Intelligence is observed under ordinary conditions, and its capabilities are tested by the response given to our training. We do not, however, in this way, in any measure account for the *genesis* of Animal Intelligence. We do not trace it to 'descent' from the higher, any more than to 'ascent' from the lower. We cannot, indeed, say that organic evolution

[1] Hutton, *Contemporary Thought and Thinkers*, i. p. 150.

[2] Romanes, *Animal Intelligence*, p. 16.

has attained its ultimatum in the higher mammals, for a further stage of evolution appears in human organism. But the 'mental element,' here present, bespeaks the activity of a new power which cannot be attributed to organic *structure* or localised in the Brain. In the latter statement, I do not mean merely to note that such localisation has not been effected, but that the 'mental element' is in its nature non-organic. That Animal Intelligence reappears in successive generations, under laws of heredity, is certain; for such intelligence is the possession of the species, *e.g.*, of the whole race of dogs, as uniformly as Instinct in succeeding generations of ants. But the genesis of this new power cannot be found within organic inheritance. In all genuine illustrations of evolution, the germ of the coming structure, with its new function, has been found in antecedent life. The *primary form* must appear lower in the scale. In this case, no such claim can be advanced. As in human history we depend on education for development of Intelligence, so it is with the training of the dog. The animal's Intelligence cannot be cultivated by good feeding, but only by good training. This fact places the dog in relation with man, in a manner impossible to lower orders of life. Darwin's theory of descent by modification is, therefore, incapable of accounting for Intelligence in the higher animals, and this, because the ascent is an impossible one from organic apparatus, granting to it even the utmost range of nerve sensibility, and of motor activity found within the animal kingdom. Professor Drummond's favourite phrase, 'the Ascent of Man,' may well suggest structural ascent from lower to higher orders, for the phrase is a good one; and, under guidance of the theory of Evolution, we are in our day engaged mainly in the study of 'the ascent of organic life.' But when the 'mental element' comes into view, as in the elephant or gorilla, the relation of the lower to the higher mammals, as interpreted in Darwin's theory, does not explain the new element which is largely in advance of structure and function on lower levels, as when we mark how far the dog is in advance of the rodent. Intelligence is so different in kind from sensibility, habit, and instinct, that the lower powers fail to supply any germ

of this 'mental' power. Cosmic law, as illustrated in the relations of organic life to environment, is inadequate to explain 'psychical' phenomena. From one level of organic structure up to another, there is a clear line of progress under 'pressure of environment'; but the improved structure achieved does not give us the genesis of the Intelligence recognised. Within this field of observation, we find nothing higher than an advance in organic functions, by advance of organism itself.

When next Animal Intelligence is brought into contrast with Human Intelligence, we remark in the lower life the absence of Reflective Power, which is the chief characteristic of man. Take this out of human life, and its central activity disappears. In its absence from the higher mammals, we recognise severance of species in a marked manner, determining our estimate of the relation of the lower Intelligence to the higher. All grant, as Darwin does, that 'man differs greatly in his mental power from all other animals,'[1] and that 'the difference in this respect is enormous, even if we compare the mind of one of the lowest savages . . . with that of the most highly organised ape.' Further, we find that 'mental power' is implied in the activity of the higher mammals, and we grant to Darwin that man's mental powers are not 'of a wholly different nature from those of the lower animals,' for the higher mammals share in common with man the Perceptive Intelligence capable of interpreting signs. But, we observe such inferiority in animal Intelligence as to imply its inadequacy to account for the higher Intelligence. Since we have passed quite beyond the sphere of organic function, the analogy supplied by evolution of structure fails. The dependence of these higher mammals on man for training, breaks the continuity of 'ascent,' familiar to us when comparing the structural relations of lower orders of life, and tracing descent with differentiation.

In view of the subordination of Animal Intelligence to human, we can attribute to the animals no more than a Perceptive Intelligence, appreciating the means employed and the ends attained, as these may be connected with animal

[1] Darwin, *Descent of Man*, p. 65.

activity; both means and ends coming within the field of animal sensibilities, and harmonising with animal instincts. These higher mammals do not deal reflectively with the results of observation; do not in any sense share with us in the search for knowledge. Their Intelligence is widely severed from a Rational Intelligence, from Reason as possessed and exercised by us (*v.* p. 84). When it is said by Darwin 'that there is no *fundamental* difference between man and the higher mammals, in their mental faculties,'[1] we accept the statement as meaning that the higher mammals and man participate in Perceptive Intelligence; and this, we think, is beyond dispute. But when he says that 'the difference in mind between man and the higher animals, great as it is, certainly is one of degree, not of kind,'[2] we must modify his statement so far as to say that in respect of Perceptive Intelligence there is only a difference of degree, whereas in respect of Rational Intelligence, there is a difference in kind, for there is a power of Intelligence *peculiar to man.* Such is the superiority of this rational power, that there is nothing within the compass of Animal Intelligence, tending to explain its genesis, or even to suggest to us the possibility of its appearance. The evidence is not only inadequate; it is really adverse to Darwin's suggestion that 'there seems no great improbability in more complex faculties, such as the higher forms of abstraction and self-consciousness, etc., having been evolved through the development and combination of the simpler ones.'[3] If Animal Intelligence is not unfolded from the Instinct possible to sensitive organism, still less can Rational Intelligence spring from Perceptive Intelligence. The lack of spontaneity and persistence in Animal Intelligence; its dependence on us for its training; and the rapidity with which we reach the limits of education possible to the dog, when taken together, supply a combination of evidence showing that there is not in the subordinate 'mental faculty' the promise of the higher gifts of Reason, which are the common heritage of man.

In the life of the higher mammals, experiences and activities may be grouped severally as Sensitive, Instinctive,

[1] Darwin, *Descent of Man*, p. 66. [2] *Ibid.* p. 126. [3] *Ibid.* p. 84.

and Intelligent. Of these, as they operate in animal life, a fairly representative view is obtained in the dog. Its *Sensibilities* are illustrated in its sense of warmth, inducing favour for the fireplace, and the disposition to bask in the sun; the prominence of its olfactory apparatus inclines the animal to single out his master by the use of his nostrils, and to run with his nose towards the ground, taking manifold circuits from the highway. Its *Instincts* are seen in the search for food, in the quick appropriation of that which is attractive, in the periodic impulse of sex, and in the female's care of her young. Its *Intelligence* is shown in the interpretation of its master's movements, in the response to his call, and in the fulfilment of his orders. These last represent the new power we name Intelligence, which does not find its explanation in organic functions. *Feeling* is an accompaniment of all these phases of animal activity, supplying for the animal the attractions of life, affecting its rivalries with competitors of its own species, and its interest in association with man. When these phases of feeling and activity are taken together, nerve sensibilities and instincts can be combined and interpreted as depending upon organic function; the third group of activities cannot be so interpreted; but the activity of Intelligence has its special attendant feeling, and these two appear together.

Naturalists, when dealing with the phenomena of Intelligence, have not sufficiently marked the contrasts in activity and in feeling now indicated. This is apparent throughout Darwin's discussion of Animal Intelligence, when he seeks to draw thence evidence favourable to the descent of Rational Power. Neglect to discriminate between organic functions and mental exercise, with attendant mental experience, has, throughout all our scientific observations and inductions, involved much confusion in the representations of man's relation to the animal kingdom. Specially apparent is this, when we are pointed towards alleged 'germs' of human power, specially of mental power found in animal experience and activity. Professor Drummond has grouped these germs as if they were forces employed by Nature for the genesis of mind, just as the germ-cell originates the organic

form. Holding that 'the most scientific way to discover whether there are any affinities between mind in animals and mind in man is to compare the one with the other,' he then gives this summary:[1]

'All the following products of emotional development are represented at one stage or another of animal life:—

Fear	Sympathy	Benevolence
Surprise	Emulation	Revenge
Affection	Pride	Rage
Pugnacity	Resentment	Shame
Curiosity	Emotion of the Beautiful	Regret
Jealousy	Grief	Deceitfulness
Anger	Hate	Emotion of the Ludicrous.'
Play	Cruelty	

Common usage, doubtless, applies most of these terms to Animal Intelligence as to human, implying a likeness between the experiences in the two cases. But there is no evidence that the words bear the same meaning in common usage, or that experience depending on Animal Intelligence helps in the understanding of the genesis of mind. This group of terms needs to be scrutinised, with the view of ascertaining how much belongs to Organism, how much to Intelligence.

As there is in all animal life organic sensibility, so there is organic attraction, desire, appetite. Conversely, there is fear, anger, fight, under force of animal passion. All these are common to *organic* life, identical in animal and in man. We have only to observe how animals are acted upon by external objects, to see that 'fear,' 'surprise,' and 'anger' are organic. Further, in observing how animals encounter each other as competitors, we see how 'jealousy,' 'envy,' 'revenge,' belong to the group of animal passions. All these must be set aside as non-mental phenomena, identical in animals and in man, depending for their manifestation on the common conditions of organic life which man shares. Again, care for the young, provision for their need, and, among mammals, devotion to offspring, which includes 'affection' and 'benevolence' as *here* used, are animal

[1] Drummond, *Ascent of Man*, p. 168.

functions, appearing in all mammals, lower or higher. Even if, in our references to the higher mammals, we do trace some 'mental element,'—for there is, shining through our use of these terms, a meaning which cannot be assigned, altogether, to Organism,—we do not thereby explain the genesis of Mind. But 'affection' in the animals does not approach Human Affection, which stands in actual contrast with the transitory impulse of mother-feeling in animal life, belonging to a brief period of physical dependence of offspring, provided for by physiological law.

Even a slight investigation of this gathering of terms shows that popular usage tends to conceal the proportions of the scientific problem. Towards solution of this problem, nothing of real value can be done by directing attention to the set of phenomena commonly described as Animal Emotions. Our inquiry must be concentrated on the difference between Animal Intelligence and the Rational Power of man, and thereafter on the possibility of Animal Intelligence affording the key to the higher power.

In closing this division of the argument, it is possible to indicate definitely the points involved in maintaining that the genesis of mind cannot be from non-mental antecedents. At the same time, it is desirable to show how our conclusion stands related to the theory of Evolution, for the acceptance of this theory does not logically imply a theory as to the genesis of Mind. The theory of Evolution concentrates on structure, and ceases to have any force beyond. It is a theory of *descent*, and the grand law of descent is that 'like produces like.' It is only a corollary of this to say that organism evolves only organic results. The provision for all that is achieved in higher organism lies within the lower forms of life, from which the movement towards differentiation takes effect. As mechanical power does not produce life, organic power does not produce Mind. The argument for *continuity* closes, when we pass beyond types of organic existence. The argument concerned with the origin of species by slight modifications of structure is, however, warrantably extended to include Instinct, for this is a feature of organic life. I therefore concur with Darwin in proceeding from

the one to the other, when he says, 'In the case of corporal structure, and conformably to my theory, the instinct of each species is good for itself;[1] but this reasoning loses all force when we pass beyond structural modifications, attempting to include mental phenomena. It is true, indeed, that mental phenomena are *associated* with brain functions; but it has been shown that there is a very large area of brain action (Fig. 9, p. 88, within which manifestation of mental power does not appear, proving that brain functions, and expressly those concerned with the nerve system, do not provide for intelligent action. The evidence on which the theory of Evolution relies, is concerned with slight modifications of structure, and fails us when we pass from the physical to the psychical,—from bodily experience and activity, to the acquisition and application of Knowledge. 'That animals have "minds" is a fact which probably no one now disputes.'[2] The evidence on which we here rely, however, is not that which sustains the theory of Evolution. Evidence in abundance there is, to show that vital organism is equal to the task of providing for its own development. But organism, whether that of the higher mammals, or of man, is unequal to the task of interpreting signs, though it is capable of responding definitely to a variety of stimuli.

I conclude that while, in the plan of vital existence presented to us in Nature, Mind appears in the activity of the higher mammals, its genesis cannot be explained by reference to Sensibility and Motor Activity of the lower orders of life. 'Animal Intelligence' is of a type inferior to the Reflective Intelligence exercised by man; and the appearance of the higher cannot be accounted for by the potentiality manifested in the lower.

[1] Darwin, *Origin of Species*, p. 193.
[2] Drummond, *Ascent of Man*, p. 165.

CHAPTER VIII

HUMAN LIFE

Comparative View

PREVIOUS investigations have supplied evidence that the natural history of life has borne on its surface evolution of higher forms. We proceed to consider more fully the highest order in Nature, human life, in the advent of which we have the first appearance of rational power, 'the Reflective Intelligence,' greatly superior to 'Animal Intelligence.'

The first part of our task here is to ascertain how man stands related to lower orders,—what is his inheritance in organic existence, and how far, otherwise, he resembles lower forms of life. Having settled those points, we shall be the better prepared for a study of his higher nature, 'the rational life,' which fits him for dominion over animals.

Human organism belongs in all respects to the system of organic life; it is moulded on the same plan, is subject to the same laws of health, is liable to the same diseases, and is endowed with analogous sensibilities and powers of locomotion. Man depends upon food, air, and exercise, just as the dog does. In all organism there is tear and wear, as with machinery; in all, combustion by effort; in all, need for renewal of energy by nutriment. Physical energy, and physical work, are strictly analogous throughout Nature.

Organic advances show *continuity* according to a common plan, the changes being induced under cosmic law operating upon the energies of organism. From the first, organic life possesses sensibility and motor activity, differences of function depending on variety in working apparatus.

The superiority of human organism appears in its *structure,*

not in the conditions under which its functions are fulfilled. In the scale of organic life, Man holds the chief place; in natural history, his advent must, therefore, be accounted for as the latest appearance in the history of evolution. His superiority in organism is indicated by complexity of structure, including comparative size and weight of brain, and variety in sensory and motor apparatus. This contrast will be fully considered at a later stage (p. 265). Comparison of the Ape with Man shows a resemblance striking to the eye, but giving muscular superiority to the Ape. Morphological resemblance is far from supplying evidence of a close approximation of the two orders of life. The Ape's inferiority in mind is immense. Comparisons founded on structure thus show a marked difference from those depending on 'Intelligence'; the former show homologies; the latter diversities. As to comparative *structure* of the Ape and Man, there is ample guidance in Huxley's work, *Man's Place in Nature,* where the main facts are given. But contrasts need to be stated with equal clearness in order that comparative affinities may be strictly estimated. When internal organs are taken as the test, the Ape is not much more like to Man than the Dog. The vital organs of all three are analogous; differentiation in the muscular system is as great in the dog as in the ape. The paws of the dog are, indeed, adapted to running; the hands of the ape to grasping branches of trees, just as the legs of the spider, three or four times longer than its body, enable it to pass from branch to branch amongst the heather and lower shrubs. The dog is at least equal to the ape in the general sensory system, and is superior in sense of smell; the Brain is nearly as elaborate in the dog as in the ape. The structural superiority of the ape appears in provision for the erect posture. The *form* of body is like to that of man, and so in consequence is the *form* of brain; but, when comparative structure is considered, a claim for great superiority cannot be sustained, inasmuch as we cannot indicate functions of the ape's life which are not performed as well in the dog's.[1] Compare brain structure in the ape with that in man, and it will appear that

[1] Huxley, *Science and Education Essays*, p. 274.

'there is a very striking difference in absolute mass and weight between the lowest human brain and that of the highest ape,' notwithstanding that 'a full-grown gorilla is probably nearly twice as heavy as a bosjesman.'[1]

If bulk of body and muscular strength do not altogether account for brain development in man, we must seek explanation elsewhere. The physiological perplexities here for Evolution are great; and Darwin suggests another key to the difference. 'As the various mental faculties developed themselves, the brain would almost certainly become larger.'[2] This, I believe, correctly states the relation. But in making brain development *depend on* mental development, the theory that advance in structure accounts for the appearance of Mind is abandoned. Man and the Ape are separated, not related; an Ape's brain is muscularly developed; a Man's both muscularly and mentally.

There is thus a marked contrast between human life and that of the higher mammals. In their life, Intelligence is of a subordinate type, in many cases depending for its best achievements on guidance from man. On the other hand, the Rational Power in human life greatly influences physical life. Mind is not merely associated with certain phases of activity, but is so incorporated, that Rational Power permeates physical experience and activity. On this account, it is impossible to have an accurate view of the mental power of man by contemplating mind apart from bodily sensibility and activity. As there is a common physical basis for all life, we can adequately represent human life only if we observe how the intellectual pervades and controls physical activity, beyond the action of the vital organs. There is, however, much more than this to be considered.

In humanity, Life is wonderfully exalted and transformed. The whole meaning of life is changed by appearance of Rational Power. In human life, we see that the instruments of action have become instruments of knowledge; that sensibility, without being superseded, is transcended, and its results translated into objective knowledge; and that, above organic movement, rational conduct is superinduced, under

[1] Huxley, *Man's Place in Nature*, p. 102. [2] *Descent of Man*, p. 54.

recognition of moral law. We may not be able to account for such transformation and exaltation. In fact, the special feature of the position is this, that when the highest results of *organic* evolution have been reached, they are forthwith transcended; for we have within human life a higher power, producing work unattainable by bodily activity. 'Life' has been lifted into a new world. 'Life' has found a new interpretation. For this elevation, Evolution of organic existence has, indeed, been a grand preparation; but towards interpretation of this advance, science, failing to find any key in the action of cosmic law on organic form, offers no contribution. The rational being is embodied in organism of the highest type; but Rational Life itself is above all the characteristics of animal life, possessing potentialities which place the *invisible* life of a man above the visible, in such a way, that the Invisible is *the* Life, the Visible only a limited manifestation of it. This Invisible Life, in its activity, quite transcends observational science. It is hidden, not merely from common observation, but from scientific observation also, lying beyond reach of the methods and instruments on which science depends. The methods of the anatomist, of the physiologist, and of the histologist, are inapplicable; for the phenomena which we name 'mental' are in a true sense intangible and invisible, eluding the incisions of the scalpel, the experimental devices of vivisection, and the highest magnifying power at command of the histologist.

We thus perceive the futility of Huxley's reasoning when he argues, that the process of physical causation is 'amply sufficient to account for the origin of man.'[1] 'If man be separated by no greater structural barrier from the brutes than they are from one another, then it seems to follow that if any process of physical causation can be discovered by which genera and families of ordinary animals have been produced, that process of causation is amply sufficient to account for the origin of man.'[2] On the contrary, the more carefully we consider the characteristics of Rational Power, the more apparent is the insufficiency of structural differentiation to account for man's superiority. We grant that 'no

[1] Huxley, *Man's Place in Nature, and other Essays*, p. 146. [2] *Ibid.* p. 146.

absolute *structural* line of demarcation, wider than that between the animals which immediately succeed us in the scale, can be drawn between the animal world and ourselves';[1] but we see in this a demonstration of the inadequacy of structure to account for the elevated life which severs man from all that is animal. If we are so like structurally, structure fails to account for the unlikeness, admittedly 'immense.' 'Man, just because it is his nature to think, is the only being that possesses law, religion, and morality.'[2] Huxley was nearer the truth, than in the quotation just given, when he wrote thus:—'It seems to me pretty plain, that there is a third thing in the universe, to wit, consciousness, which, in the hardness of my heart or head, I cannot see to be matter or force, or any conceivable modification of either.'

The manner in which Darwin opens his chapter entitled 'Comparison of the mental powers of man and the lower animals,' well deserves consideration here. He says, 'We have seen in the last two chapters that man bears in his bodily structure clear traces of his descent from some lower form; but it may be urged that, as man differs so greatly in his mental power from all other animals, there must be some error in this conclusion. No doubt, the difference in this respect is enormous, even if we compare the mind of one of the lowest savages, who has no words to express any number higher than four, and who uses hardly any abstract terms for common objects, or for the affections, with that of the most highly organised ape. The difference would, no doubt, still remain immense, even if one of the higher apes had been improved or civilised as much as a dog has been in comparison with its parent-form, the wolf or jackal. The Fuegians rank amongst the lowest barbarians; but I was continually struck with surprise how closely the three natives on board H.M.S. *Beagle*, who had lived some years in England, and could talk a little English, resembled us in our disposition and in most of our mental faculties.'[3] The admissions here are of large significance. No one thinks

[1] Huxley, *Man's Place in Nature, and other Essays*, p. 152.
[2] Hegel, *Logic* (Ency.); Intro. Transl. Wallace, *Logic of Hegel*, p. 3.
[3] Darwin, *Descent of Man*, p. 65.

of urging that the *bodily structure* of man places him at 'an enormous' distance from the higher mammals; on the contrary, it is reasonable to describe these animals as 'mammalian congeners.' If, then, Darwin admits that the difference mentally is 'enormous,' and would continue 'immense,' even if the higher mammals were improved to the extent to which the dog has been 'civilised,' the theory of Evolution encounters here a difficulty of far greater magnitude than in anything connected with comparative Nerve Sensibility, Brain Structure, or Instinct. 'The missing link' in organic structure is a trifle in comparison with the immense distance which separates the higher mammals intellectually from man. Whatever the physical analogies and homologies, they are of no avail to abridge the distance which separates man intellectually from the animal world.

The above quotation shows Darwin's consciousness of the gravity of the situation for his hypothesis. To it, these words are added,—'If no organic being excepting man had possessed any mental power, or if his powers had been of a wholly different nature from those of the lower animals, then we should never have been able to convince ourselves that our high faculties had been gradually developed.' In the case supposed, it would have been necessary to abandon the hypothesis of Evolution of Mind. The same result will, however, logically follow, on the inadequacy of Structure to explain Animal Intelligence, and of the latter to account for Rational Intelligence. We need sufficient potency in Life itself, for cosmic law to work upon, in order to secure the elevation contemplated. Without this, no basis is secured for Evolution; because the potency at command is inadequate. That lower orders possess 'mental power' is an unexplained fact. Besides, we remark, in Animal Intelligence, the lack of the tendency towards 'the perfection of its kind,' which we have observed in the history of Organic Life. Animal Intelligence, even under our training, does not give such promise of advance as would sustain the theory that Rational Power had its genesis from this source. That the whole animal kingdom has its organic structure built up on a common plan is very obvious. That

man, too, belongs to the animal kingdom is granted; and this admission has wider significance than before, when we accept the theory of Organic Evolution. We therefore readily adopt the words of Huxley, already quoted, on man's reluctance to own kinship with the animals,—'It is as if Nature herself had foreseen the annoyance of man, and, with Roman severity, had provided that his intellect, by its very triumphs, should call into prominence the slaves, admonishing the conqueror that he is but dust' (*Man's Place*, p. 146). When, however, it is alleged that the animals are *like to us in Intelligence*, or have Intelligence the same *in nature*, there is no weight of evidence to support the assertion. Admitting that the Intelligence of the higher mammals goes quite beyond the Selective and Purposive action common to the lowest forms; and also beyond the wonders of Instinct, appearing on higher levels; and that it is Intelligence in some measure like man's; it remains true that the Intelligence of man is in its essential characteristic *unlike* to that of the higher mammals.

Let us draw the lines of comparison still closer, utilising Darwin's supposition that 'the higher apes had been improved or civilised as much as a dog'; let us also imagine that the results of human training could have been reached without man's intervention; that the civilising power had been provided for under cosmic law, securing results like those of man's training,—even thus, 'Dog Intelligence' offers no helpful suggestion as to the genesis of the Rational Power, in the exercise of which we possess law, morality, and religion. This appears by reference to the barriers encountered in our efforts to train the dog; in the limits of possible 'education'; in the consequences following on release from it; and in the facility with which 'educational gain' is lost to the animal. The evidence thus gathered goes to show that, in the state of nature, Animal Intelligence works only in association with animal wants and instincts, and for more ready fulfilment of animal desire, but does not tend to advance towards independent rationalising. No doubt it is true that 'if no organic being except man had possessed any mental power, then we should never have been able to convince ourselves that our high faculties had been gradually

developed' (*Descent of Man*, p. 65). No doubt, Animal Intelligence may become to the Imagination a bridge providing a passage from the territory of Organism to that of Mind. But the presence of a bridge is not accounted for by its convenience for transit. On the hypothesis of Evolution, 'Animal Intelligence' in the higher mammals must first be accounted for, by reference to the lower mammals. But, even with Animal Intelligence granted, Darwin feels hard pressed in attempting to bridge the chasm between the Ape and Man. He suggests that Nature has crossed a greater chasm before, since 'there is a much wider interval in mental power, between one of the lowest fishes, as a lamprey or lancelet, and one of the higher apes, than between an ape and man; yet this interval is filled up by numberless gradations' (*Ibid.* p. 65). We have, however, already seen that reference to 'mind' in the lowest fishes is unsustained by evidence, as it is inconsistent with Darwin's main position as to 'Animal Intelligence,' which he restricts to higher forms, contending only that there is no fundamental difference intellectually between the higher mammals and man. If Intelligence, in the higher mammals, is not a new thing in Nature, there is no occasion for perplexity. In that case, the genesis of Intelligence in mammals does not call for a bridge from one territory to another,—from non-mental antecedents to mental phenomena,—but only a gate out of one field into another. But when, in his 'comparison of the mental powers of man and the lower animals,' Darwin tells us 'his object is to show that there is no fundamental difference between man and the higher mammals in their mental faculties' (p. 66), he virtually grants that there is a 'fundamental difference' between the 'higher mammals' and all lower orders. If we have succeeded above in distinguishing between Instinct and Intelligence, we have contributed towards acceptance of Darwin's view at this point. This position can, however, be accepted only on condition of the surrender of 'numberless gradations' of Intelligence from the lancelet upwards. This granted, it remains subject of reasonable consideration whether we shall ever be 'able to convince ourselves that our high faculties have been gradually de-

veloped.' Specially hopeless is it to argue from the Selective and Purposive action, manifest in the cell, or in one of the lowest fishes, that we see in these phenomena the presence of Mind, or even preparation for its appearance. There is nothing more obviously within the province of physiology than appropriation of nutriment. The question of the genesis of the Rational Power of man must, therefore, be discussed from these two positions, that the higher mammals are *related* to man as no other animals are; and that man is *separated* from the higher mammals by an immense distance, by his exclusive possession of Rational Power. The attempt to bridge this chasm by scientific methods involves an unwarranted elevation of 'Animal Intelligence,' and an unwarranted depreciation of Rational Intelligence, taking as test of the latter the intelligence even of the Fuegians, who 'rank amongst the lowest barbarians' (Darwin, *Descent of Man*, p. 65). It is true, indeed, 'that if no organic being except man had possessed mental power,' the perplexity would have been still greater than it is; but man's power, being so much above that of the anthropoids as it is, there is no explanation as to the manner in which Rational Power could be evolved from such Intelligence as that of the ape or dog. There is, indeed, no scientific view of comparative biology possible to us, other than that which recognises ascending phases of Intelligence, as of organism; but the 'ascent' is not in the case of mind as in the case of structure. Within the region of 'mental power' there is no evidence that the Higher Intelligence has come 'by gradual modification and development' from the lower. We are left without data to prove that 'descent with modification' explains the genesis of Rational Power, whereas up the whole scale of Organic Life the evidence for such descent by gradual modification of structure is clear and abundant.

When we concentrate on the two distinct grades of Intelligence in Nature, the theory of Evolution cannot claim scientific value, such as it has when organic advance is under review. Granting that Intelligence *first* appears in the higher mammals, several important conclusions follow. On this admission, Mind is not a function of Brain, being, *ex*

hypothesi, associated only with the more highly organised brains. The claim of 'Intelligence' for the lancelet must be abandoned. The wide interval which separates the lowest vertebrate from the highest anthropoid is an organic, not a mental, interval. Intelligence as a new appearance has to be explained without reference to the 'numberless gradations' in the evolution of organic life. Considering the close relation of Intelligence with Organism in man, the hypothesis has been presented that Mind is a function of such complex Brains as are found in the highest vertebrates. But the facts overturn this hypothesis. That Mind invariably appears in relation with elaborate Brain organisation; that Mind gives visible manifestation of its presence, only through the agency of organism, are positions granted; but nothing so granted implies that Mind originates from non-mental antecedents, or even depends on Brain structure and functions for its own proper activity. The admitted positions imply the contrary.

Darwin's reference to the 'lamprey or lancelet'—representatives of the primary forms of the vertebrates—has an obvious scientific value. Taking the animal kingdom as a whole, including man, we recognise along the entire line, the gradual advance in complexity of the central organ,—the Brain,—the history of progress being 'filled up by numberless gradations.' As a sensory system belongs to all Organic Life, from the protozoa upwards, we agree in attributing a continuity of 'sense' up the whole scale, and a steadily advancing order of selective and purposive action, giving to all life some share in discrimination; a 'common *sense*,' taking this phrase away from the accepted usage of the Scottish philosophy. This obviously is the truth present to Darwin's mind, which is pressed into service for defence of his own hypothesis. But the defence is ineffective, as must appear the moment we assume his standpoint, claiming only for the higher mammals 'mental faculties' not fundamentally different from those of men. 'A common sensibility' is assuredly a possession of all Organic Life from the lancelet to man; and this 'sensibility' is such as to guide in like manner all living beings in their selection of the nutriment

suited to maintain life. There is nothing more surely established than the unity of organic existence in this respect, implying dependence on common apparatus, and subjection to common law, with continuity of structure and of function, up the whole line, in a steadily advancing complexity of organism, and a correlative complexity of Brain. But unity and continuity in these respects being granted, Intelligence is recognised as the possession of only a limited portion of the animal kingdom. All evidence that concerns 'common sensibility,' and all that illustrates animal Instinct, is accordingly to be laid aside as inapplicable, when we are dealing with Intelligence, which manifests itself in phases of action such as these,—recognition of the relations of means and ends, interpretation of signs, and aptitude for training to act in accordance with such interpretation.

On these grounds, it seems obvious within the field of Comparative Zoology, that Man, occupying the highest place in the animal kingdom, and being possessed of sensibilities common to all animals, is in comparative structure vastly superior to all the higher mammals; while, in respect of Intelligence, he possesses a superiority greater still, separating him from the Anthropoids to an extent immeasurably beyond structural differences. This conclusion throws discredit on the hypothesis of Evolution of Rational Power from 'Animal Intelligence.' The consequence is seen to be still more serious, when we remark that the assumptions resting on the relation between comparative structure and Comparative Intelligence are so far falsified, that the Dog, inferior in structure to the Ape, is superior in Intelligence,—a fact not only admitted by Darwin, but utilised in his argument, when he says that the difference intellectually between the Ape and Man 'would still remain immense, even if one of the higher apes had been improved or civilised as much as a dog has been in comparison with its parent-form, the wolf or jackal.'[1] To this must be added a further conclusion—that the measure of 'Animal Intelligence' seen in the dog illustrates how that of the ape has been surpassed because of this dog having been 'improved or civilised' by man.

[1] Darwin, *Descent of Man*, p. 65.

CHAPTER IX

HUMAN LIFE

The Nerve System as an Instrument of Knowledge

THE higher relations of a nerve system are now to be considered as these appear in human life. From a very low level in the scale of organism, we have traced a sensori-motor system, co-ordinated in a more or less complex central body. Advance in complexity of the nerve system is continued until in the mammals we have a complicated central arrangement consisting of spinal cord, medulla, bridge, cerebellum, and cerebrum or Brain. As complexity of organism advances, the Brain, always a double organ, in two hemispheres, closely related to each other, becomes more elaborate, changing from a simple smooth type into a form showing manifold convolutions. In this scale of advancing complexity the human Brain is much the most complicated in Nature. The general aspects of increasing elaboration will be appreciated by reference to the diagrams now introduced (Figs. 11, 12, 13).

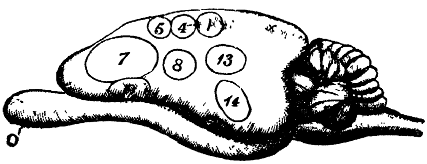

FIG. 11.—Brain of Rabbit. (*From* Ferrier.)

These three figures represent different stages of complexity in the central body controlling the sensori-motor system of the animal life indicated. The nerve system is constructed throughout on a common plan; it is similar in the structure of nerve fibre and of brain tissue; all forms of Brain do their work under common laws; all accomplish similar functions. Only by reference to the nerve system of the animal do we

explain, on the one hand, its sensibility to external impressions; on the other, its powers of motor activity. So it is when we explain man's sensibility in his relation to the outer world, and his activity as represented by use of the muscular system. In these respects brain-action is the same in man's life as in animal life. There is no need for dwelling on these common

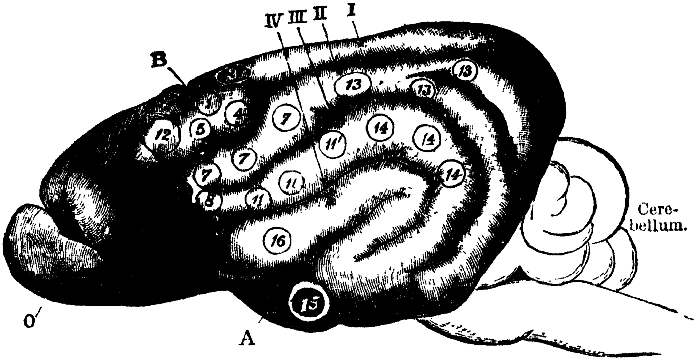

FIG. 12.—Brain of Dog. (*From* Ferrier's *Functions of the Brain.*)

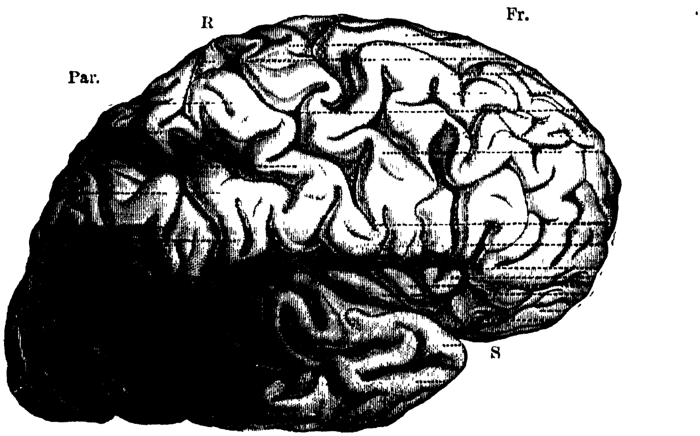

FIG. 13.—Brain of Man. (*From* Quain's *Anatomy.*)

characteristics. Elementary physiology of the sensori-motor system will suffice for our purpose. The nerve system of the medusa, the fish, the frog, and the rabbit readily meet the requirements of illustration. Evolution has produced the vastly more complex nerve system of man, and fitted it for being the instrument of knowledge. The sensori-motor

reflexes will serve to show the difference between structure and function working in organic life. The same mechanism, utilised by Mind, will illustrate its use as an instrument of *knowledge*. This will appear from the following illustration:—

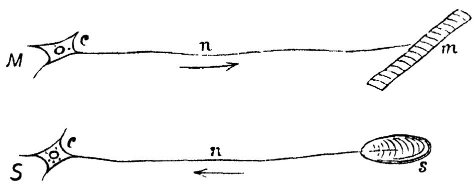

FIG. 14.—Diagrammatic representation of the relations of Motor and Sensory Apparatus.

M, motor apparatus; *c*, motor cell; *n*, nerve; *m*, muscle. *S*, sensory apparatus; *c*, sensory cell, *n*, nerve, *s*, sensory corpuscle, as in touch. The arrow indicates, in each case, the direction in which the impulse is conveyed.

This slight diagram supplies the key to the whole mechanism of the nerve system from its simplest to its most complex form,—sensibility at the surface of the body, nerve communication with the central body, represented by a nerve cell,—a store of nerve energy in the central body, again represented by a nerve cell,—a line of nerve communication with the muscular system, providing for movement of the muscles. This is an epitome of the whole structure, and of all phases of nerve action. The representation can be grasped with ease; the intricacies of the nerve system of man, however, are such that they cannot be traced by the combined efforts of anatomists, physiologists, and histologists.

With this simple key at command, let us take a comparative view of the nerve system in its common functions, from its first appearance up to man. This system, on its *sensitive* side, provides for living contact with environment, and for varying forms of experience in accordance with the sensitiveness of organism; on its *motor* side, it provides for action along the lines of communication connecting the nerve centre with the muscular system, which acts in response to impressions made from without. This brief statement represents the essential functions of a nerve system, acting and reacting in contact with environment. The results of the evolution

of this structure are seen at their maximum, in the marvellous differentiation and co-ordination presented in the anatomical structure of the human body. From the lancelet to man, the structure, the functions, the conditions of activity are the same; from the lower extreme to the higher, *animal experience* varies only according to the diversity of sensory organs; *animal activity* varies according to differentiation in muscular structure. To depict the contrasts between the lowest and the highest organisms, we may take the single nerve cell as representative of the lowest; the human brain as representative of the highest. In all this, we contemplate the nerve system exclusively in its relation with the material universe, the cosmos to which it belongs.

The illustration of the lower phases of structure may be represented at the extreme by Lanceolate Fishes. These are without paired fins; the notochord is persistent; there is no

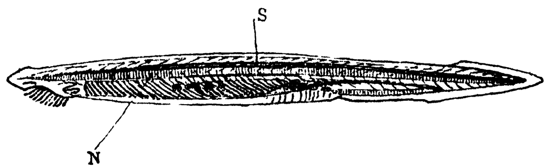

FIG. 15 —*Amphioxus lanceolatus.* Slightly enlarged. The lowest vertebrate. N, persistent notochord, S, spinal cord.

skull-capsule; the blood is colourless, and there are pulsating vascular trunks (Claus, *Text-Book of Zoology*: Sedgwick's trans., vol. ii. p. 150).

To what complexity of structure the central organ has been raised will appear from the representation of the human Brain (Fig. 13), which is packed within the skull in manifold convolutions, presenting a largely extended surface, the functional activity of the cortex being illustrated by the brilliant experiments under electric excitation which have definitely localised many centres of activity. See p. 88 and p. 286.

Within this large central organ, there are concentrated at its centre the nerve fibres, sensory and motor, connecting with all parts of the human body; within the convolutions, constituting the outer surface of the organ, the nerve cells

are congregated. A section of this grey matter, or cellular tissue, will show the formation of the cells, their combination within the soft substance of the Brain, and the intricate arrangement of fibres connecting them together (Fig. 17).

With the help of the simple diagram,—Fig. 14, p. 120, the reader has only to keep before the mind the fundamental

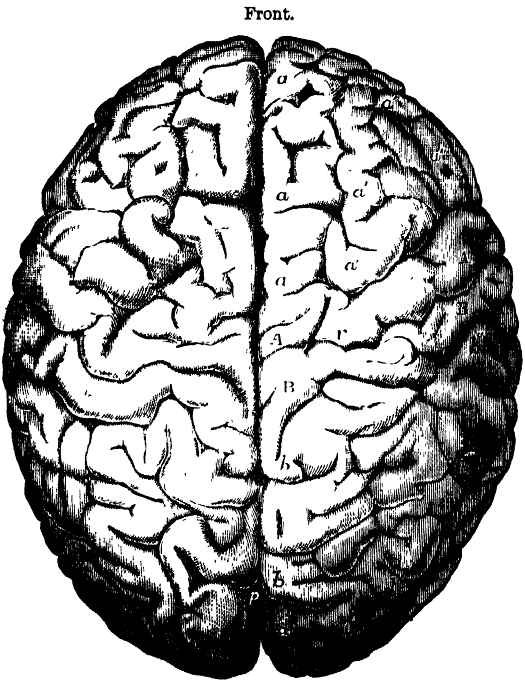

FIG. 16.—Upper surface of the Human Brain. ½

(*From* Quain's *Anatomy*, after R. Wagner.)

'This view was taken from the brain of a famous mathematician, Professor C. F. Gauss, who died in 1854, aged 78. It is selected as an example of a well-formed brain of the full size with fully developed convolutions.'

functions of the nerve system in order to present readily and with sufficient accuracy all that is achieved in human life by the Brain, with its attendant afferent and efferent nerves, in its relations to the outer world.

We must here grasp the full significance of the Continuity of Organic Life. From the first appearance of nerve sensibility

upwards, and specially from the primary aspect of a vertebrate structure presented in the lancelet, up to Man, the structure of the nerve system, the plan of it, and the laws of action are identical. On this wonderful scale, continuity is unbroken. Man is the crowning feature in the animal kingdom. He is in structure what the animals are; the higher mammals are his 'congeners'; his nerve system, with its ingoing sensory nerves, and its outgoing motor nerves, and its central organ, or Brain, fulfils the same functions in his animal economy as the nerve system does in that of the frog, the rabbit, and the dog. Add to this Animal Instincts. These are varied in character according to the species of animal life; but they are common for all life in these fundamental features,—Instincts of self-preservation, reproduction, and care of the young. These are essential to human life, precisely as to all other orders of animals. 'It will be universally admitted that instincts are as important as corporeal structures for the welfare of each species, under its present conditions of life.'[2] Further, let us complete our view by adding the Special Senses, with enlargement of the field of sensibility and activity, consequent on their structure. We have seen in the jelly-fish the beginning of sensory points, the germinal

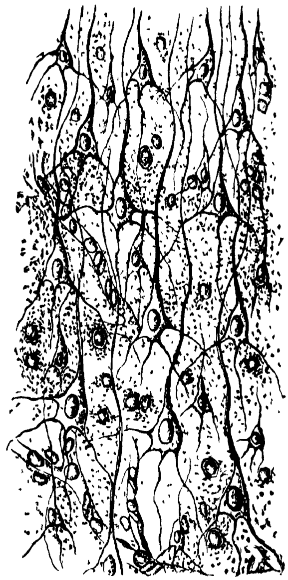

FIG 17.—Section of the grey matter of the Human Brain, magnified to show the cellular structure [1]

(*From* Turner's *Anatomy*.)

'Vertical section through the third and fourth layers of grey matter of the superior frontal convolution. Large and small-sized pyramidal nerve cells; the neuroglia, with its corpuscles and some capillary blood-vessels, are represented.'

[1] These illustrations are transferred from my work, *The Relations of Mind and Brain*, where more extended account of the entire structure may be found.

[2] Darwin, *Origin of Species*, p. 192.

forms of structure providing for sensibility to light and sound. On a steadily advancing scale, the range is extended by growing complexity of terminal organs, culminating in the human organism, where each special sense is a marvel in the intricacy and nicety of structure. The human Ear, for example, has a succession of three chambers leading towards the point where the auditory nerve throws out its sensitive tendrils. The outer Ear is a cavity whose lining is provided by carrying the skin inwards, stretching it over an osseous opening to constitute the drum; the middle Ear, a chamber filled with air supplied from the throat, has within it three

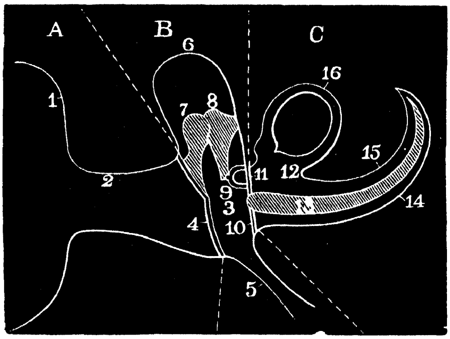

FIG. 18.—The internal arrangements of the Ear.
(*From* Professor M'Kendrick's *Outlines of Physiology*)

'Diagrammatic view of the auditory apparatus (*Beaunis*) A, external ear; B, middle ear; C, internal ear, 1, concha; 2, external auditory passage: 3, tympanum; 4, membrana tympani; 5, Eustachian tube; 6, mastoid cells; 7, malleus; 8, incus; 9, stapes; 10, fenestra rotunda, 11, fenestra ovalis, 12, vestibule; 13, cochlea; 14, scala tympani; 15, scala vestibuli; 16, semi-circular canal'

minute bones, nicely adjusted, to which in succession movement is communicated from the beat on the drum; this movement is continued by a stirrup-shaped bone along a third stage of transit, through *two* openings into the inner chamber; within the third Ear are the circular canals, floating a bony structure, by slight movement of which the sense of direction is given; on the other side, there is a spiral-shaped shell of bone, with opening at the base, rising to an apex, and having stretched within it a series of slight nerve fibres, given off by the auditory nerve, fulfilling the functions of

extremely minute tuning-forks, sensitive to the slightest movement communicated.

The human Eye is still more elaborate in delicacy of structure. Externally there is the transparent 'lens' through which the light passes; behind this, a large globe filled with fluid; over the back part of this globe is the network or retina, given out by the nerve fibre, and tinged with 'sight purple,' receiving a coloured impression of the object from which the rays of light are transmitted; behind this a minute elaborate structure, consisting of ganglionic cells, a series of

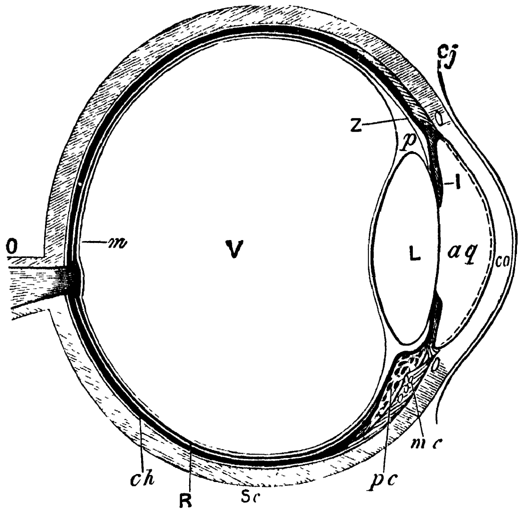

FIG. 19.—Structure of the Eyeball

(*From* Turner's *Anatomy*)

'Diagrammatic section through the eyeball. *cj*, conjunctiva; *co*, cornea; Sc, sclerotic; *ch*, choroid, *pc*, ciliary processes; *mc*, ciliary muscle; O, optic nerve; R, retina; I, iris; *aq*, anterior chamber of aqueous humour; L, lens; V, vitreous body; Z, zonule of Zinn, the ciliary processes being removed to show it, *p*, canal of Petit; *m*, macula or yellow spot. The dotted line behind the cornea represents its posterior epithelium.

granulated layers, and a bacillary layer, constructed by a combination of innumerable transparent cylindrical rods and pointed cones; and behind these a layer of pigment cells. Under the stimulus of light, these pigment cells come into contact with the rods and cones; and forthwith the impression is carried along the nerve of vision. All this we know as to the structure: how little as to the work done!

The sense organs thus briefly described will stand as representative of the special senses. With these descriptions, we can form a general conception of the entire nerve system, as it fulfils the functions of an organic life,—the structure, conditions, and laws of action being the same within the elaborate organism of Man, as in the higher mammals. With these results supplied by anatomical and physiological science, we see what is meant by the continuity of organic life, and by the superiority of human organism, as the culminating feature reached by a succession of slight changes through ages of advance. The whole scheme of the sensori-motor system belonging to the animal kingdom can thus be depicted with comparative certainty.

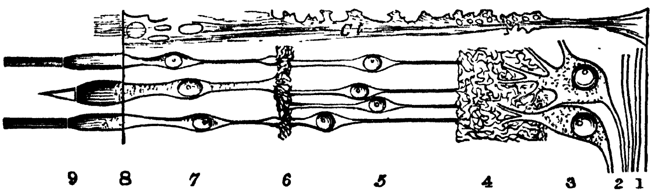

FIG. 20.—Structure of the Retina.

(*From* Turner's *Anatomy*, modified from Schultze.)

'Diagrammatic antero-posterior section through the retina to show the several layers:— 1. Membrana limitans interna, 2. Layer of optic nerve fibres; 3. Layer of ganglion cells; 4 Internal granulated (molecular) layer; 5. Internal granule layer; 6 External granulated layer; 7. External granule layer; 8. Membrana limitans externa, 9. Bacillary layer, or layer of rods and cones; *Ct*, Connective tissue of the retina.'

From the common and special features of this system, as related to a *muscular* organism, we can next pass on to its relation to *Mind*. In making this advance, for the purpose of including the mental phenomena belonging to human life, there is not observable any new or special feature of the nerve system itself; that is, we do not trace anything additional in structure or in function. Let the anatomist and physiologist tell us if it be not true, that the whole nerve system and all its functions come within their field of research. Psychology claims no part in it. But Scientist and Psychologist agree that the nerve system is in vital relation with Mind. Two quite distinct fields of research touch as closely as is possible, making it needful to contemplate the relation

of Brain functions to that vast mass of facts in human life included under 'mental phenomena.'

In contemplating this new relation, much of very great importance is included within the functions of the nerve-system itself. 'Intelligence' marks a dualism in life, whether the power so named be traced in the higher mammals, or in the human race. The Brain, with attendant nerve ramifications, is by its common functions in vital relation with the whole muscular system, and this relation is clearly traced by reference to its own structure, and the nerve apparatus attached. But, in Man, this Brain is further in relation with Mind, as is shown by the command Consciousness takes of bodily activity. This relation, however, cannot be traced from below upwards, by the methods of observational science. All the results presented under electric excitation of the cortex of the brain, illustrate functional activity in relation with the nerve fibres and muscles. The conditions of such experiments clearly involve this, so that no one expects to discover in this way anything beyond phases of bodily excitation. Action of a mental character cannot thus come into view, for the relations of Brain to Mind cannot be traced anatomically and physiologically, as its relations to Body have been. It is clear that the higher relation must remain in this obscurity, making the method of maintaining it, and of securing its efficiency, the subject of inference, and not of direct knowledge. This conclusion is confirmed by the fact, that while we are throughout conscious of our reflective processes, and of our determination to give effect to our decisions, we have no consciousness of exercising dominion over Brain functions, notwithstanding that we are well aware from life-long experience, that we do control our muscular powers, distinguishing the 'voluntary muscles' from automatic action of vital organs.

The relation of Brain to Mind is well assured, while we continue ignorant of the manner in which sensory excitation produces sensations in our consciousness, and of the manner in which our conscious determination brings about motor activity. What we know, and are assured of every hour of the day, is that impressions reach us from the outer world,

and that our own purpose originates muscular activity. We know directly only the thought, feeling, and purpose within us, knowing nothing directly of the Brain and its attendant sensory and motor apparatus; but knowing that it is easy for us to use our senses, and to exercise the physical energy which accomplishes our design. If this normal relation between Mind and Body be disturbed, we know that our inability to exercise our physical powers is the result of disease, with which our physician must deal; or it is the temporary effect of some physical agent, such as an intoxicant or a narcotic, the use of which we must regulate. A very limited range of simple and familiar facts may indicate the nature of the evidence on which we are assured of the intimate relation between Mind and Brain. The central bodily organ, with co-ordinated nerve apparatus, works the muscular system, and that is worked by the mental powers. Our Life is one, and its complexity such that its activity can be explained only by reference to these two sides, bodily and mental. With the structure and functions of the body, science has now made us familiar, laying bare Nature's secrets; with the powers and activities of the mind we are all familiar without aid of Science, or of Philosophy; but of the manner in which Body affects Mind, and in which Mind affects Body, neither Science nor Philosophy has helped us towards an understanding. Here, Nature still keeps her secret.

Recognising this region of the unknown, the common task for Science and Philosophy is to make clear the difference between the lower and the higher relations of the Brain, acting as a nerve centre for human life. The higher relation appears only in the higher orders of beings; first and more simply, and much more restrictedly, in the higher mammals; afterwards, much more extensively, in Man. For purposes of interpretation, we concentrate on our own activity, as known with certainty, and as consciously directed by voluntary management of our own muscular system.

In our life, it is certain that the nerve system has fixed relations of two distinct kinds, first with the periphery and the muscles of the body; further, with conscious thought

and purpose, as these are concerned with experience and conduct. This double relation has never appeared in course of the research which has given us the theory of Evolution. Up the whole scale of vertebrate life, from its first simply-defined form in the lancelet to the lower mammals, it has not appeared at all; and it is chiefly within this region of observation that the phenomena of evolution have been traced. Even when we have reached the rodents, there is nothing to be explained in Brain activity beyond its relation to the bodily structure. When we ascend to the higher mammals, a New Power appears. For the first time in animal life, the nerve-system is seen acting in relation with this additional and higher agency, namely, Intelligence. When we pass to human life, we find this new power appearing, not, as in the higher mammals, as if it were an adjunct of the lower powers, but as a commanding power, in closer relation with Nature as a whole, capable of knowing the order of things all around, exercising through this knowledge and by use of Nature's laws, a power in some ways akin to that power which rules Nature itself.

This double relation of Brain, as it is seen in human life, is the new thing we have now to contemplate. In reaching the confines of an intelligent world, we find that material representations of activity do not meet the requirements of illustration. Nevertheless, we may still say that neural activity has a lower and a higher relation; on the one side, being in communication with a material world; on the other, with an individual Intelligence. At one extreme, is a *common* material universe; at the other, a *single* and separate Personality. The nerve-system thus doubly related is as a measure of capacity placed in any field of industry. Material objects in *their* movements can at best knock against this vessel, or, by accident, fall into it; Intelligence is required to make use of its capacity by filling it. Notwithstanding the manifest disadvantages belonging to this physical analogy, we may consider the nerve-system with its vital sensibility as a measure of capacity relative to the fruits of knowledge. This nerve-structure does not produce the fruit, does not even gather it. It lies open to external

influence, as, in the orchard, the measure is ready to receive the falling fruit. Displace Intelligence and its instruments, and we have descended into the region of animal sensibility and appetite. Replace this relation, and the impressions made on the sensory system in all varieties can be observed as distinct, can be interpreted, and a measure of knowledge received by the active Mind.

The grand characteristics of Intellectual Activity will steadily unfold as we proceed; this dual relation of the nerve system is to be kept steadily in view. Neural phenomena (sensory, central, and motor), being recognised and interpreted on a basis common to *all* life, the contrast presented by the dual relation as now apparent is that, on the lower side, there is *muscular movement*; on the higher, *thought procedure.* The muscular movement we explain by reference to the functions of the nerve-system; the *thought procedure* we do not so explain. The relation in the one is Physical, in the other Mental. The muscular movement may be produced by the nerve-system alone, the whole procedure from the periphery to the muscles being a single continuous movement along the lines of enervated apparatus, started by external stimulus, and in its completed form a reflex. The Thought procedure cannot be so produced: one half of the nerve system, from the periphery to the Brain, is brought into action; the other, or motor, side of the nerve-system being quiescent, or quite subordinately active, the 'reflex' no longer appearing. The new power, intellectual in character, does not come within compass of the movements of nerve apparatus; yet is it so in relation with its sensory activity —whether we have experience of smell, sound, or light, does not signify—that we have intelligent exercise, saying 'rose,' 'gun-shot,' or 'burnished surface.' The nerve-system is essential for this experience, explaining movements from the periphery to the nerve-cells, as affected by excitation. Intelligence, moving from its own centre, interprets occurrences within the sensory apparatus, assigning an objective meaning to our subjective experience. This relation of the nerve-system on its higher side to an Intelligence is novel. Intelligence, however, does its own work,

gathering up its own results, securing 'knowledge' of the outer world, in addition to the experience consequent on organic sensibility.

The nerve-system gives, on one side, muscular *movement*; on the other *knowledge*, Reflective Intelligence distinguishing qualities in external objects, so acquiring a knowledge of the outer world. This dualism is that to which we refer, when saying that the contrast is enormous between the rodent and man, and even between the anthropoid and the human being; and this, not so much by reason of structural differences, as by reason of exercise of a new power, securing acquisition impossible to the animal nature.

We must take heed that this difference between the nerve system, as related to bodily and to mental activity, be not again obliterated by a confused use of the term FEELING. To guard against this, it is needful to restate these relations, so far as they admit of being expressed in the language of feeling. There are two quite distinct phases of Feeling, the one being that which belongs to *Organism*, including sensibility and animal impulse and instinct; the other the feeling which belongs to *Mind*, depending on intelligent appreciation of the qualities of objects, including pleasurable or painful emotions springing up in consciousness, consequent on the judgments we form as to personal conduct or experience These two orders of feeling, continually appearing together in human life, are parted by Intelligence, as the valleys north and south are separated by the mountain range between. Neglect of this explains the erroneous belief that phases of animal feeling are germinal forms of intelligent feeling. The mass of emotions attributed to animals, in support of the suggestion that our feelings and theirs have much in common, shows how inquiry has been beclouded by disregard of differences in efficiency. (See p. 104.)

This contrast between these two phases of Feeling, Organic and Mental, must be firmly maintained throughout the sucessive stages of this argument. The contrast is that between Feeling as it is the expression of organic sensibility, common to all organism from first to last; and Feeling as it is the expression of Reflection, therefore impossible to organism,

from the simplest to the most elaborately constructed. The one is *Touch-Feeling*, organically produced and organically experienced; the other is *Thought-produced Feeling*, intelligently awakened, the exclusive experience of the rational agent. By the constitution of human life, these two are separated in origin. They can readily be blended in a common experience in our case, as sensibility in nerve and sensation in consciousness are co-related; but they are distinct in source, constituting in their combination an experience which can belong only to the rational life. Great is the difference in life-experience when rational power is at work, concerning itself with something larger than management of physical activity.

Much light is thrown on this contrast, when difference in capacity of Feeling among animals is noted, with advancing differentiation in organism. This appears by reference to common sensibility, and to the functions of special senses. Following on the references already made to the medusæ, attention may here be turned to the auditory vesicles in their structure, where there is not a central nerve-system. The growing possibilities of organic feeling become apparent, in advancing from the eye-spots of the scallop, to the large eye and massive ocular nerve of the cuttle-fish. More striking still in the elaborate structure of the antennæ of insects, of which it is computed there are 100,000 species.[1] Still further is the range of Organic Feeling extended, when we add the phenomena of Instinct, with all the varieties of passion and of appetite possible to animal life, and fully shared by us. In addition, and in marked contrast, we have the wealth of Feeling and Emotion, which stirs only in response to Intelligence. Such Feeling, in endless variety of character, rises and falls in our consciousness; glows or pales, as our thought works in one vein, or in another; carries us on wings of enthusiasm, or restrains our energies with a load of depression, as Expectation is expanded or contracted. A temporary advantage, of considerable value, may be gained if we transfer terms and phrases indiscriminately across the boundary separating body from mind;

[1] Huxley, *Science and Education Essays*, p. 283.

severing rational life from organic on the wide territory of general zoology. But, for an accurate representation of the characteristics of the different orders of life, we must note that there is a difference in kind between bodily feeling and mental. Scientific procedure will be imperilled, if these two phases of Feeling be taken as common characteristics. If Rational life be a different thing from Physical life, rational feeling must differ from physical. If the same terms are made applicable to both, their meaning must be varied according to the sphere of application.

Our concern, however, is mainly with the relations of the nerve-system to Knowledge, and beyond this to Thought, as the functions of Intelligence are prior to certain Feelings. Every sensory nerve is a line of communication with the field of Knowledge, as it is besides with muscular apparatus in the field of motor activity. We concentrate now on the relation first named. When Knowledge is the end of the activity of sensory nerves, under external excitation (muscular apparatus being quiescent), Intelligence *turns back* on the sensory activity, so as to interpret what has occurred. This may be named the 'reflex' of Intelligence, which, however, is not the physical reflex, but Reflection, a voluntary attempt to understand one's own experience, as occasioned by our relation to an outer world, or 'world of sense.' This distinction between a physical reflex, and Conscious Reflection, illustrates the meaning of the higher side of the nerve-system, with a higher relation, having its end in Knowledge. A stinging effect starts up in my hand, which I instantly withdraw by a sudden muscular effort,—this is a physical reflex; having regard to this occurrence, I say, an insect has stung me, or subcutaneous irritation has somehow sprung up,—this is conscious reflection. Such intellectual exercise is not a single transitory occurrence, such as a physical reflex, but is a part of a continuous exercise, frequently renewed, and ever enlarging in range, so as to increase our knowledge, accumulating our stores. There is a continuity in Mind-work, and along with it there is a breadth of reference which admits of no limit, as reflection passes from details of experience to the wider fields of Nature. Sensory experience thus stands

related to our Intelligence; through the sensory side of our nerve-system, Mind is placed *in relation with* a universe of material existence. A much more restricted range belongs to the other side of our nerve-system, as that is concerned with motor activity. This side gets imbedded in muscular tissue, and can work no wider; can do no more than effect a process of expansion and contraction there, depending on intelligent purpose for industrial reward. This contrast shows how we come to speak of *Brain as the Organ of Mind.* It is not that Brain thinks, any more than that Brain wills; but that Brain, as a centre for sensory and motor apparatus, does much in the *service* of Mind. The motor system may, however, be largely inoperative, while the sensory system must be continually active, to enable Mind to maintain its relations with Nature. All sensitive points in the body, and the various terminal organs for nerves of special sense, are vehicles of experience, constituting together an index for possible knowledge. 'With eyes and ears open' means a thousand times more for a man than it can mean for his 'mammalian congener,' the dog; or for anthropoid apes.

With nerve facilities at our command, there are necessary limitations and restraints. The *limits* are recognised at innumerable points, because Mind, in its reflective power, is ever outstretching the sensibilities by which consciousness is environed, raising inquiries which organic apparatus does not raise for itself, and cannot solve. But most are we sensible of the *restraints* occasioned by fixed relation with a sensory system. The nerve-system, as a portion of organic life, is liable to exhaustion of its powers, giving rise to sense of weariness. This brings daily check on human effort, educational as well as recreative, literary and industrial. With this there come the necessary restraints of a season of rest. The phenomena of Sleep naturally accompany those of vascular recuperation. As there is sense of rest in cessation from toil, so is there sense of freshness in waking from slumber, and entering on the engagements of a new day. The phenomena of dreaming naturally attend on activity of Mind, while sensibilities are only partially dormant. That our sensory nerves are to such an extent inactive as is

implied in the state of sleep, accounts for grotesque combinations which seem utterly improbable when recalled. How far our dreams, and more particularly our directly reflective exercises during sleep, are coherent, and even valuable to us in waking hours, depends on the discipline of Mind which has been gained. In this relation, 'Mind-habits' are distinct from 'apparatus-habits.' The evidence for this contrast is increasingly abundant as intellectual discipline advances in life, and specially as intellectual exercise is a distinctive life-occupation.

In contemplating the nerve-system as an instrument of knowledge, as we have now done, we do not note anything new in the nerve-functions themselves; the new feature is the *relation* in which the system works, so serving a new and higher purpose. The primary end, *Organic Sensibility*, is secured, as in all organic life; but, in advance of this, *Knowledge* is also attained, laying the foundations of *a new experience.* Of this experience there is only slight indication in the activity of the organism. Resultant experience depends chiefly on Brain structure, and is thus far concealed from ordinary observation. But the new *experience* belongs essentially to Consciousness; it is treasured by *memory*, by action of which its efficiency is secured, as there may be sustained exercise of reflective power. 'Memory' is, indeed, a word which may be interpreted exclusively in terms of structure, for the impress of action appears in the organic effects of disciplined mental exercise in development of the convolutions of the cortex;[1] but Memory, acting only on condition of antecedent exercise of reflective power,—'rational memory,' as we may say,—is a distinct power attendant on the activity of Intelligence, the results being possessions in consciousness alone. If, therefore, we speak of '*consentience*' as the common experience of vital organism, *Consciousness* includes all that pertains exclusively to the rational life.

We have now to trace distinctive features in the activity of the nerve-system, consequent on its function as an instru-

[1] 'As the various mental faculties gradually developed themselves, the brain would almost certainly become larger': Darwin, *Descent of Man*, p. 54. See Gauss's *Brain*, Fig. 16, p. 122.

ment of knowledge. That every nerve-system is constructed of two sets of fibres, sensory and motor, is the initial truth of elementary physiology. These two sets of nerves are co-ordinated in a nerve-centre, more or less complex according to the bodily structure within which it works. The peculiarity belonging to human life is that, of these two sets of fibres, the sensory set is often operating *apart from the motor.* There is no disturbance of the integrity of the system, but *it is working one-sidedly*; it is fulfilling its function as an instrument of knowledge, and in connection with this, the motor system finds comparatively slight occupation. The whole system, as a unity, lies ready for use, supplied with needful nerve-energy from the cellular tissue. There is no block on any line to hinder a reflex; but the sensory system is doing something else than regulate motor activity. Quite apart from the motor system, it is rendering the highest service to a rational life. Without the least disturbance to the nerve-system as a whole; without separating the activity of the system from that which is common to all organism; without any new function additional to that of transmitting sensory impression; a New Invisible Power is utilising the sensory nerves, so as to gather by their aid a knowledge of the outer world.

The motor system also presents its own witness as to the dominion of this invisible power, operating beyond the organic functions. Left for a season in apparent neglect, the motors are suddenly put to use. Nerve action in this case is no longer that of the 'reflexes,' familiar in the action of all organism. *Voluntary use* of the motor system is witnessed now, for execution of some decision formed within our own Consciousness; silently formed, often after long deliberations. This distinct concentration of muscular effort cannot be interpreted by reference to antecedent activity within the central system itself, nor by sensory excitation at the periphery, where the common start of nerve action is made; nor from pressure of urgent instinct; nor from force of passion, such as accounts for animal conflicts; but by reference to Thought, which has shaped its purpose for attainment of apparent interest, or for fulfilment of duty.

Most familiar are these experiences, but so important that human activity, as indicated by them, appearing at one time in the action of the sensory nerves, at another in the activity of the motor system, is always on a level so high, that the higher mammals, gifted as they are with 'Animal Intelligence,' cannot in the least understand it, or in any measure imitate it. The Rational Intelligence, utilising and commanding the entire nerve-system (apart from the automatic forces of the vital organs) alone affords the complete explanation of our interpretation of sensory impressions, and of our voluntary control of the motor system; accounting, besides, for much more in plan and purpose concerned with the greatness of human life.

Unreserved and unrestricted acceptance can be given to all that has been advanced in the interests of a theory of Organic Evolution, without accounting for the human activity of which we have just given a slight sketch. Darwin says: 'As man possesses the same senses as the lower animals, his fundamental intuitions must be the same' (*Descent of Man*, p. 66). Most true. As the laws of light belong to the physical world, the action of light must be analogous in its effects whether it throws into excitation the pigment spots of the scallop, or the eye of the cuttle-fish, or the organs of vision in man. Whatever the variety of structure, inducing variations in sensory impressions in these three cases, there is continuity of structure up the whole scale of organic life; and light, acting according to its own laws, finds centres of excitation in all of them. If we judge of the results by visible movements, how different is the darting of the cuttle-fish through the waters from the action of a man wielding his pen. If we judge by knowledge acquired, man has no rival, as he alone seeks knowledge for its own sake. So we may proceed, illustrating by very familiar facts that sound and smell operate in the rodents, as they do in the higher mammals and in man. Sense-nerves are the same in structure and in function for all three; but sound acts on the rodent only as a warning, on the dog as a guide to instinctive action, on man as an aid to knowledge, when he is employing powers of intelligent observation. It is the

'high mental faculties' of man which separate him from the animals, whatever the organ of special sense employed; and this separation is manifest even when 'his reasoning powers remain poorly developed.' Seeing how the nerve-system is used by him as an organ of knowledge, it becomes impossible to maintain that in the history of life on the earth, evidence testifies to the presence of no higher power than can be explained by continuity of Organic Structure, with attendant continuity of function.

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CHAPTER X

HUMAN LIFE

Mind Immanent in Body

We pass now directly to the centre of our life, whence we are able to contemplate the outgoing of our activity from its inception to its execution. This is possible, because Self-consciousness is characteristic of our experience. Each man lives and truly acts in the midst of the secrets of human life. We know others, only by noting their doings, sharing in their conversation, and co-operating in their work. But, within our own consciousness, we have immediate knowledge of our thoughts and feelings, our plans and purposes, our motives and expectations. These we know, as we never can know the secrets of animal life. We have thus before us the whole course of our conduct, from the inner reflections, through rising and falling sentiment and emotion, to the execution of our purpose in physical activity. A blank space, however, remains. We have no direct knowledge of the activity of Brain. For knowledge of this, we are dependent on Physiology. The difficulties consequent on such a blank space are many; but they have been largely surmounted by successful research into localisation of Brain functions. We are thus assured of distribution of sensory and of motor centres in the cortex; of co-ordination of these centres; and of inter-communication between the two hemispheres. The result is, a well-defined understanding of the common system of nerve action. We know that action of Brain is involved in all the physical processes by which we maintain sensible and motor relations with the outer world. By this system of inter-communication, we at once

gather our knowledge of the external, and execute our purposes.

My special aim now is to take the standpoint of Self-consciousness, gaining thence a view of our action from its centre to its circumference. Each man knows the history of his activity, as no other can know it. The testimony of consciousness is thus unique. No other life can be known in this direct manner. Such knowledge is distinctive of rational life, and essential to it. To act rationally, we must have regard to rules of conduct for direction of procedure. The agent reflects on what seems desirable or dutiful; he is conscious of inducements to act; he considers their value, their suitableness to his situation, and the probable outcome of acting in accordance with them; he forms his purpose; and afterwards, he reflects on his conduct, laying up the lessons appearing in the consequences. This brief description traces the activity of Mind as it is immanent in Body. It also sets forth the contrast between man and the higher mammals. They have only Perceptive Intelligence, while he possesses a Rational Intelligence, working by reference to understood rules, and by use of general conceptions, always distinguishing mental activity from physical.

The physical basis of activity, common to man and animals, may be represented in two ways. The first organic representation appears in the basal ganglia,—the *optic thalamus* and *corpus striatum*, as these show the massing, at the base of the brain, of the nerves from all parts of the body. The second appears in the cortex of the brain, the mass of grey matter overlying these ganglia, specially as shown by the circles marked and numbered, indicating the verified localisation of functions, as shown on the figures 12 (p. 119) and 25 (p. 268). We further seek some accurate representation of the indwelling mind in the dog and in man. In the former, the evidence has been traced in the chapter on 'Animal Intelligence,' p. 90, the psychical phenomena being best represented by the animal's co-operation with man. The Immanent Intelligence is such as gives the animal 'knowledge' of objects, and of our signs, and of the execution of our commands. This is 'knowledge' common to the animal

and us, but it is comparatively restricted, giving a sorry representation of human knowledge.

In the Human Species, 'knowledge' proves a larger thing, and the indwelling mind is to be valued accordingly. We must, therefore, place the Immanent Mind in these two lives, far apart in respect of the powers at command. We recognise a common basis of action and a common knowledge; but the knowledge man has beyond the common possession, is so extensive as to be the main part of human knowledge. This implies a higher intelligence, unexplained by 'animal intelligence,' even though human organism be accounted for by evolution from lower animal structure.

The exact measure of this difference between the Intelligence of man and of animal will be seen, if we note that the enlargement of 'knowledge' as it belongs to man, depends upon 'thought,' or reflective exercise, while prosecuting observation. This Reflective Exercise is well represented in our rejection and acceptance of conclusions, as when we say that a position is not proved; or when we claim that evidence is conclusive.

Reflective Power is known as a living force at the core of our being. All that we intend by our *Personality* is connected with our Rational Nature. Hence, we may say that the Mind has possession of the Body, as the tenant has possession of his dwelling. Mind has its habitat within the organism. Evidence does not seem to warrant an attempt to localise it, as we do functions of brain. The fact that the latter are clearly localised in the central organ, requires us to regard Brain as the organ of Mind, by immediate relation with which knowledge is obtained, and control of physical activity is exercised. The popular conception of Mind as distinct from Body is strictly correct. The contrast between the Rational and the Physical in our life, conspicuous in daily experience, is confirmed by the advance of physiological science. Where Mind meets Brain in effective control, the *meeting* shows the diversity in nature, and in action of the two powers. Most convincing is the Physiological evidence, as indicating the difference of the laws of activity traced in organic action, from those regulating mental procedure; for

example, in the difference between the laws of nerve action, and the laws of logic; between the laws of sensory excitation and motor activity, on the physical side; and the laws of non-contradiction and sufficient reason on the mental. Physiology has never set itself to develop a Logic. It is no part of my contention that it should have done so; my contention is that it cannot do this; therefore, it should be acknowledged that Physiology cannot supply a completed account of ordinary human activity.

We cannot *act* without finding within us testimony to the contrast between our thought and our muscles; and its expression is only varied when we contrast Thought and Brain action. Spinal-cord reflexes bear witness, that we can readily move our muscles without our Brain; but we cannot voluntarily move them without our Mind acting on Brain. Even in acting under animal impulse, we *know* that we do so; this is the additional fact which tells of an Immanent Intelligence observing what is being done within the sphere of the physical. We feel the force of appetite, and we turn attention from that which would gratify it. Bodily action and Mind action go together; the bodily energy cannot produce reflection as to right conduct; mental power cannot do the work of bodily organs; but, the Mind within the body, and cognisant of the impulse stirring, can control this impulse, being in vital relation with all activity managed from the brain. Rational purpose can control the central organ which governs the muscles. That Mind can do so, without having within compass of its consciousness the location of the brain, or the laws of its activity, or the connecting lines which place it in vital relation with the muscular system, makes our easy exercise of mental power the more surprising, and its comparative superiority to bodily powers the more clear. These facts warrant in a most striking way the conviction of the independence of the bodily and mental life, as well as their interdependence, and their unison in a single life. There are thus three distinct orders of facts in our life-experience. That the body acts as possessor of an independent life is admitted, in the fact that all organic life lower than that of the higher mammals holds

its place in Nature under physical conditions alone. That the mental life is a new appearance, an additional life, and not merely a new form of life, consequent on slight modification of pre-existing structure, is granted by attributing Intelligence to the higher mammals and to man, distinguishing the 'mental element' appearing in the action of these high orders. That Mind takes possession of Body, and controls its activity, is granted in admitting that interpretation of sensory experience is effective in directing action, as is established on the evidence of Intelligence even in the dog. Much more clear is it in human action, when sensibility, instinct, and passion are controlled by the Mind, in its reverence for higher law than physical impulse can supply, or than can be provided by combination of all such impulses, natural as they are to man, even as to all the animals around.

As the Rational Mind is immanent within the human body, the evidence for the relative independence of each is abundant. Mind has no part in the digestive process, supplying the nutriment which recuperates Brain, by an abundant blood-supply for the grand central organ. The same independence appears when we trace the lines of activity. Brain energy differs from Mental power as sensorimotor activity differs from reflective exercise, and as muscular effort differs in the field of result from acquired knowledge or deliberately matured conviction as to principles of conduct. To say that as the liver secretes bile, so the brain secretes thought, is to use in the first clause language exceedingly appropriate, because descriptive of the physical occurrence; in the second, the language is exceedingly inappropriate, because inexpressive of any observed occurrence. That the cellular tissue of the Brain secretes nerve-energy, we know; that it secretes anything else we do not know; that the structure depends on the vascular system for its nutriment, and so stands in physical relation with material environment, we know; but our thinking power is not accounted for in this relation. That Brain does not produce our courses of reflection as to self-interest, duty, or the general good, we are well assured by conscious use

of our Intelligence. That for clearness and vigour of thought, we so far depend on a plentiful supply of wholesome food, and also on a regular amount of sleep, we know; but we are as well assured that neither food nor sleep produces thought, though both together contribute to energy of Brain. These contrasts are founded on the facts of daily life, and they are inconsistent with the hypothesis that Brain produces thought. Its insufficiency for this work is too palpable to require that we should enter on elaborate disquisition as to the nature of our Ideas and the laws of association by which they are combined. 'Ideas' are products of intelligence, not forces producing results. We need to account for their presence in consciousness by reference to the powers active within the conscious life. To say that we, as intelligent beings, originate, form, and connect our ideas, is correct; hence we charge ourselves with the inadequacy of our ideas, if they do not harmonise with observed facts; we naturally have the credit pertaining to our own work, if by continuous research, and the judgment of competent observers, we become satisfied of their accuracy.

These familiar facts show that there are two quite distinct phases of power in human activity; that nerve energy is subordinate to rational power, and that Mind possesses and uses Brain as a living instrument, at its own exclusive command. It is no less clear that Brain is an independent organ, acting as the efficient centre of the activity of an elaborate structure of nervous and muscular apparatus. This appears on evidence quite distinct from that on which we rest our main contention as to the immanence of Mind in Body. Two powers, two lines of activity, and two sets of results, are traced quite through all the complications of experience by the blending of phenomena, physical and mental. The physical life is as independent of the mental, as the mental life is independent of the physical. We do not create Brain energy by any volition of ours; we do not even lead the energy to the point to be operated upon; we do not, by a volition, induce it to move thither; it is there, waiting our command; and we do command it, and that by simple volition, without knowing how the action is

accomplished, or even *that* it is done, except as the fact is rendered obvious by indirect evidence supplied by our muscular activity.

Having seen the relation of the physical and mental life in respect of the laws of their co-operation, and their relative dependence in providing for activity of the life as a whole, we remark here the *failure of the continuity* upon which the theory of Evolution has depended throughout. Slight modifications of structure supply convincing evidence of physical advance; but such modifications are not available here. The manner in which Mind holds possession of Body proves that we have to deal with a distinct problem. In actions quite familiar to us all, nerve sensibility, animal instinct, and animal passion, are taken hold of by a higher power, and controlled in a manner of which no trace has been found, till we had advanced to the higher mammals. Laws of Evolution have been made familiar as operating in the history of structure. In the territory of organic existence the foundations were laid, and the structure reared, of a theory of 'descent with modification.' Now, we have transcended this area; we find that Nature is larger than we might have been tempted to suppose, as the spell of a great discovery lay freshly upon us. 'Descent with modification' has no meaning here. We are noting the presence of a higher power taking possession of the organism. The power is new; the relation is new. We are facing a potentiality, previously unobserved, in presence of which a familiar vocabulary proves narrow and unavailing, having no application or significance. 'Modification of structure' is no longer the matter of observation; 'struggle for existence' circulates as a familiar phrase where it did, but has no currency here; 'struggle towards an ideal' has a meaning which found no expression in earlier investigations; there is a grand ideal visible to Rational Intelligence, yet, even to such intelligence, only partially visible—for it is seen in forms of duty, when sensory impression, or instinctive movement, or tumult of passion, is being controlled; an ideal still invisible in its vaster outline, for this cannot be compressed within our comparatively narrow and ever-changing forms. The view of

life thus seems to be an expanding panorama, within which each new standpoint shuts out so much lying below, and much more, far overhead. Modifications of structure lie full in view, and the long ages of their history have been skilfully deciphered; but Rational power is not concerned primarily with our muscular activity, but with the inward worth belonging to a spiritual life. While all species of modified structures fight their way on the earth's surface with such force of Brain and muscle and of passion as belongs to them (and we, too, take part during our short day in the thick of this struggle), the Rational Power within us, comparatively a new appearance in Nature's lengthened history—a power dealing with duty and destiny—flashes its ideals across the heavens, believing in an intelligent and intelligible world, in which organic structure has neither place nor part. What has all this to do with modified structure? What, indeed! but much to do—I had almost said *everything* to do—with human life in its larger sense.

That Darwin should dwell on the fact of common possession of Special Senses by the lower animals and man, and that he should on this ground maintain that man's 'fundamental intuitions must be the same' as theirs, is both natural and reasonable. But the fact that these Special Senses belong to the great majority of the animal species, is in itself enough to suggest that the structure and functions of these organs can supply no part of the explanation of the distinctive features of human life. Lower forms of animal life, even the invertebrates, are sensitive to light and sound. The appearance of pigment spots among nerve arrangements is noted quite early; fishes are conspicuous for great power of vision,—'the most intellectual of the senses,' as it has been called; and even the cuttle-fish has prominent eyes, with a large optic tract. Nature's perspective warns us against the induction which Darwin here favours. Not in the special senses themselves is there testimony found for the immanence of Mind in Body, but in our use of them. The common power is used in new ways, and for ends which could not be sought, apart from Rational Power, higher than the Perceptive Intelligence of the dog. Evidence here is

abundant. The Sense of Sight may be selected as affording illustration. The organ of vision, in variety of structural adaptation, is included within the heritage of all the vertebrates. Its mechanical and chemical appliances are at command from early life; its structural adaptation is completed under organic heredity. Intelligence contributes nothing here; the marvels of structure and functional activity yield no evidence of intelligence, operating *within* the process of their evolution. Thus it appears that the 'fundamental intuitions' of which Darwin speaks, as common to the animals and to us, must be taken as intuitions of sense, not of intelligence. The sense-organ is sufficient to reveal to the animal, as to us, any obstacle in its way, or any moving object near at hand; it is sufficient to guide the animals, as to guide us, when obstacles are to be shunned or objects are to be reached; the trout can dart from a pike quicker than we can escape danger; the wagtail can catch flies faster than we can see them. In the structure and functions of the organ itself, we trace no evidence for the immanence of Mind within the life. But we have only to remark the training which is practised by us in the use of vision, to observe on all sides abundant evidence for the dominion which rational power has over the complex mechanism of the eye, of whose structure it knows next to nothing, until anatomical science has taught us what are its marvellous possibilities. The precision with which the chicken picks up a corn-seed, or the cat pounces on a mouse, is organic promptitude, under force of animal instinct. The precision with which the rifleman directs the bullet on the bull's-eye, tells of the control an indwelling mind has secured by long practice, profiting by extended experience. Practice means so much more in human than in mere animal life, because the rational power *sees by aid of sight* that which the animal cannot see. What differences are to be recorded even among us, on account of the direction we have given to the power concentrated in the organ of vision! It is not great intellectual ability which is revealed by this use of the eye, but the common intelligence of man in all its ordinary lines of engagement. We find proof of this in the training of the

eye and hand for work in which skill must be attained, as when the rifleman manages his weapon. The philosopher may be a bad marksman, or a good one, but his philosophic power does not aid him here. Intelligence and patience gain the mastery by ordinary practice. Experts in this field may, or may not, be highly gifted in reasoning. We recognise only the extent to which ordinary intelligence has taken possession of the organ of vision, and of the muscles to be co-ordinated, that the focus may be found, and the rifle kept steadily in position. Varying results depend on the extent to which a man has taken possession of his organism. Examples may be multiplied at pleasure. They are thick as blackberries in a favouring autumn. In all field practice, for example, in all outdoor sports, in all powers of manipulation, in all mechanical art, in all manifestations of artistic aptitude, illustrations may be gathered plentifully. The *expansiveness* of power, possible in many of these directions, becomes striking to ourselves. We need only make reference to 'the artistic eye,' catching at a glance varieties of form and colour unobserved by others; and by more slow and deliberate adjustment and readjustment of focus, appreciating a wealth of beauty in Nature, practically hidden from common observation. To this eye, Nature has spread a richly varied carpet in the undergrowth of the forest; to others, there is only a gathering of slight bushes, blaeberry, cranberry, and cowberry, with junipers here and there. Both views are true to Nature, the latter truer to botanical science than to art; the former truer to art than to science. The difference of view depends on the extent to which mind has gained possession of the organ of vision, and on the direction in which mind has used the apparatus.

Without multiplying illustrations, the distinct characteristics of human life are obvious. The functions of our Minds far exceed in importance *distinctive* features in man's bodily structure. Even when evidence is gathered from the physical life itself, it is the *use* made of bodily powers, far more than the powers themselves, which gives to man a distinct place in Nature, separating him by a wide circumference of power from all the higher mammals. His 'con-

geners' they may be; but his peers they cannot possibly be. The best of them owe their best to his 'civilising' power; none of them possessing a mind which *can* take possession of their organism, as he takes possession of his bodily structure by use of his Intelligence.

The general conclusion to which this part of our inquiry conducts, is the immanence of Mind in Body,—a conclusion adverse to the Evolutionist's plea for continuity. In human life there are *two centres of activity* quite distinct, yet so closely related as to constitute together one life,—a life so high, so strangely varied in acquisition, so rich in possession, that the effort in our day proves futile to classify together the higher mammals and man,—the anthropoids and the anthropoi,—otherwise than as mammals closely allied in structure. That the latter classification is fully warranted on anatomical and physiological evidence, is beyond question. But the unlikeness in Mind, and manifestly in the measure in which Mind utilises structure, are such, that organic *similarity* becomes an argument against the hypothesis that 'descent by modification' accounts for Mind. That animals so like should be so unlike in mental power, is in itself a consideration of great weight against the supposition that the Mind in the higher life has had its genesis from a Mind so inferior that it is comparatively helpless towards advance, without the aid of the higher.

That there are conspicuous aspects of resemblance between man and the animals nearest him, it is important to know and acknowledge; and that Darwin has made skilful use of the facts will be readily granted by all who are acquainted with his works. But the critical consideration now is this, that resemblances fail to meet the requirement of an argument for descent. Among supposed germs of human power in animal life, it is natural that our author should have fastened upon familiar phases of feeling or 'emotion,' and more especially on that distinguishing feature of mammals, the tenderness of the mother-feeling towards offspring. But the relation of structure, function, and feeling is in this instance so close that, under physiological conditions, we cannot suppose these three to be separable. The mother-

feeling must be experienced by mammals, just because they are mammals. This feeling is no specialty of the higher mammals, but is common to all species within the order. It is, therefore, erroneously regarded as a form of the 'emotion' belonging to a rational life, and Darwin's argument is here unsustained. This conclusion is confirmed by other considerations closely connected. The tender feeling is mother-feeling, strong in her so long as lactation continues, but subsiding as physiological conditions are modified; it is a feeling not shared by the male, a clear proof that feeling here is due to physiological, and not to mental causes. The superiority in human life, where parental affection has a high moral value, is that, beyond this tender feeling of the mother, common to her with all mammals, Mind holds possession of organism, all the while making account of interests, obligations, and expectations, as only rational power can, and securing a unity of parental affection otherwise impossible. The mother-love is common to mammals, whereas the parental affection common to father and mother with us, belongs to a rational life. With the human mother, animal and rational feeling play their part in unison; and accordingly, maternal affection continues an abiding force, after physiological dependence of the young life on the mother-life has come to an end.

Darwin has overestimated the value of physiological facts, and has overlooked the significance of rational power, when he argues that 'any animal whatever, endowed with well-marked social instincts, the parental and filial affections being here included, would inevitably acquire a moral sense or conscience, as soon as its intellectual powers had become as well, or nearly as well, developed, as in man' (*Descent of Man*, p. 98). The 'animal endowments' are overestimated here. 'Parental and filial affections,' such as ours, go *with* a conscience; 'parental and filial affections,' such as all mammals have, go without a conscience, as Darwin admits, in saying that a conscience might be acquired by the animals. 'Parental and filial affections' are of short duration in animal life, whereas conscience has its function in the government of feeling which is possible at all times, and not essentially

dependent on physiological conditions. To stipulate for intelligence 'as well, or nearly as well, developed as in man,' is to confess the weakness of the position, and to overlook the logical demands. A searching scrutiny of the conditions on which we recognise our moral obligations would show that these involve a potentiality much greater than is found in 'well-marked social instincts,' even when 'parental and filial affections,' such as those of the animal, are included. Rational power must be immanent in body before account can be made of the duty of affection in any of its forms. In this we apply the test only of the common intelligence of humanity, taking it at its average level, or even lower. It is in the absence of rational power that the explanation is to be found of absence of conscience. It is, therefore, natural, when Darwin drafts a summary of his argument, that he should admit that Duty, as it is concerned with 'right feeling,' does not appear among animal perceptions. If an animal can perceive the duty of parental and of filial affection, it must follow that the animal can equally recognise the duty of affection in wider relations. Darwin describes what 'an anthropomorphous ape, if he could take a dispassionate view of his own case, would admit' (*Descent of Man*, p. 125), and among other things, he says, some apes 'might insist that they were ready to aid their fellow-apes of the same troop in many ways, to risk their lives for them, and to take charge of their orphans; but they would be forced to acknowledge that disinterested love for all living creatures, the most noble attribute of man, was quite beyond their comprehension' (*Ibid.* p. 126). That is to say, these animals could not comprehend the notion of duty as applicable to feeling. Animal love of offspring, supposed to be the germ of ethical feeling in man, contains no ethical element, no preparation for its appearance. The higher mammals love their offspring just as the lower mammals do, and not as men and women do. The tender feeling of the animals, which so attracts us, is limited in range, temporary in duration, and dependent on physiological conditions,—in all these respects is by its nature diverse from ethical feeling, and unfitted to awaken it, and, making no movement towards an ethical

feeling, visibly disappears and dies out. So a mammal's 'affection' continues from generation to generation through the centuries, showing nothing of mind-action at the heart of it. There is a wide difference between mental feelings, affections, and emotions, as we speak of them; and maternal feelings in animals. Our terms have larger significance; in human life there is soul in everything; rational power is the efficient at the centre of all experience. Immanence of mind appears in all feeling peculiar to humanity; but in comparatively few cases in animal life.

The process traced in this Chapter, which I have described as the procedure of mind in taking possession of the body for its own ends, as it is a mind-centred process, takes its effect outwards towards the circumference of the being, telling on the action of the special senses, and of the muscular system. From the order of these relations, it naturally shows itself least in the activity of the *common sensibility* of the body, just as electric excitation of the brain, because of the central position of excitation within the organism, gives us motor results much more readily and obviously than guidance as to centres of sensibility. Strictly speaking, as the evidence adduced shows, we do not take possession of the peripheral sensibilities of our bodies, and this simply because our rational activity is slightly concerned with our common sensibilities. The sensory system, supplied to us in the organism we inherit, is given as a phase of structure efficient within itself,—automatic in action,—so that the primary condition of our life is that we are stirred in consciousness by the action of living apparatus which we do not control. These in-going nerves tell their own tale of an outer world, as contact brings the two into relation. We possess the common sensory system; this is all that can be said, for in this respect we are not more favourably placed than the animals. At this point, they are often more favourably placed than we. It is where organism comes under control—comes directly into the service of the rational life—that rational power voluntarily takes possession of it, gradually extending its hold as efforts are renewed towards attainment of ends intelligently selected. This is the explanation

of the fact that our references as to mind-action are made chiefly in connection with the special senses, and with the muscular system. It is necessarily in the field of *action* we gather evidence of our special power. If the sensory is included, it is by reason of personal activity in the management of sensory organs.

The facts on which I am founding are commonly recognised in ordinary experience, our observations being crystallised in everyday language. Having constantly a regard to the practical in life, we indicate our appreciation of the process by our reference to *results*. Hence it is that we familiarly make use of terms such as these, 'a musical ear,' 'an artistic eye,' 'the cunning of the right hand,' 'words fitly spoken,' —in each of these making reference to a visible presence of Mind in physical functions. All these phrases, and many more, indicate the common recognition of the fact that Mind takes possession of the organism, making it do higher work, yielding results of a more important kind than can be had by a quiescent sensibility. Our wealth does not flow in through open doors, while we watch its arrival. Work is, for a rational life, the condition of reward; and this has its worth according to the intelligence shown in making use of our bodily powers. Acquisitions thus secured, whether common or special, constitute a part of our 'education' outside the school; some of these are now finding attention within the school as 'technical education' bearing on our industries, just as it had previously included 'musical education,' somewhat unfortunately, though not altogether inaptly, described as an 'accomplishment.'

More detailed illustration will be found by reference to Speech, and this is all the more striking, because the voluntary element is somewhat concealed under the facility acquired. By use of an imitative tendency, guided in growing measure by intelligence, the child first brings its vocal powers into exercise. Partly under imitative proclivity, partly impelled by the desire to make known its wants, the child steadily extends its efforts. Unwittingly, as effort proceeds, the vocal apparatus in the larynx and the brain centres are being coordinated, and speedily the whole of the parts concerned attain

aptitude for co-operation. Ere long, the Mind has gained possession of the physical powers, as the reward of effort and training, largely physical. When control has been secured, the Intelligence of the child has at command a familiar instrument of communication with others, easily used at will, without knowledge of the conditions on which the functions of the organism are fulfilled. Pathological conditions, coming continually under observation of the medical faculty, illustrate the normal control of organism in use of speech. Various phases of Aphasia attending on diseased states of the vocal organs, or of the nerve-centres on which they depend, have shown conclusively that in all speech the Mind has gained possession of appliances within the organism. Pathological evidence further suggests that mental power may continue unaffected in itself, even when its expression is painfully restrained by paralysis of apparatus.[1]

On the data now adduced, the double nature of man is established. Mind is immanent in body, its presence being indicated by interpretation of the sensory, and by control of motor activity. Mind's efficiency appears in the possession it gains over all parts of the structure, whose use implies direction of motor activity from the brain. While the unity of the life is admitted, and it is virtually established by the evidence on which we rely for proof of the distinctness of Mind, there are in reality two lives in the one, the powers of each operating under distinct laws, the Bodily being, however, so subordinated to the Mental, that Mind takes possession of organism, effectually establishing dominion over apparatus, when placed in relation with the Will. That these two orders of life, physical and mental, are distinct, is shown in many ways, but specially in this, that each has its own proper centre, and is regulated under its own order of law. Mind is the centre for the whole, only because it is the higher in Nature, and a governing power over body, at least in so far as

[1] Full treatment of this important division of evidence will be found in Broca, *Sur le Siége de la Faculté du langage Articulé*; Kussmaul, *Disturbances of Speech*; Bateman, *On Aphasia*; Ferrier, *Localisation of Cerebral Disease*; Wyllie, *On the Disorders of Speech.* I have considered this subject at length in *The Relations of Mind and Brain.*

a physical structure is capable of serving rational ends. That Brain is the centre of physical life appears in these facts, that it is the governing power of physical activity, sensory and motor; and that the laws regulating the interaction of central and peripheral activity operate quite independently of our choice. Further evidence of the independence of bodily life is supplied in the structure and functions of the 'vital organs,' whose vigour or feebleness determines our physical health. That Rational Power is the centre of psychical life, regulating a cosmos of powers as varied in nature and functions as the several structures within the body, appears in these facts that it is directly the governing power over all our thoughts, and indirectly the controlling power over such feelings, affections, and emotions, as are superior to the feelings of the body, and in large degree the *producing power* of the deeper feelings, inasmuch as these depend for their appearance in consciousness on antecedent exercise of thought-power. That the Rational power is the centre of the life as a whole,—human life in its unity,—appears in this, that Mind controls for its own ends the Brain, which is the centre of organic life. That Body and Mind are severally independent, while relatively dependent, is established by this, that within each life there is a large field of activity with which the other can have no concern. If our subjection to physical decay and death suggests the possible severance of the two, the large field of independent action belonging to each will sustain the belief in a separate existence for the soul. That there is in Nature separate existence for Body, is established by the presence on the earth of every species of animal lower than the higher mammals; and this supplies the complement in the argument for separate existence of Mind.

CHAPTER XI

HUMAN LIFE

Mind Independent of Body

THE relations of Brain with Mind become more obscure as we penetrate into the phenomena of consciousness. The activity of the central organ of the body becomes less certain, while we have the highest certainty as to the character and relations of our thoughts. The centre for organic life is less obviously in request, more obviously liberated from effort, if not quiescent, as we become more deeply engaged in long processes of reflection. The subject about which we think does not affect the mind's relation to the activities of Brain, unless the subject be exciting to physical feeling. Whether we ponder how our interest will be involved in certain possible contingencies; or what the truth is when evidence is incomplete, and in some respects conflicting; or what our duty is in a given situation, when some friends advise action in one way, others action quite the reverse; the predominance of Rational Power, and a comparative abatement of activity in Brain, seem well to describe our estimate of what is being done. Judging of these facts by common observation, there is nothing which warrants us to refer more than a subordinate share of our activity to the Brain. Again, taking the test of the common functions of the nerve-system, it is plain that neither the sensory nerves, nor the motor, are very largely at work, while we are pondering the question how to act in view of the responsibilities of life. Unless we are observing external occurrences, or are engaged in conversation with others, noting expressions flitting over their countenance, and sensitive to their opinion,

or influenced by the interest they have in our action, the nerve-system, more particularly the nerve-centre, is only partially involved. Our thoughts are ours, otherwise than by neural force. Our reflections are so restricted to consciousness, that when thus engaged, our relation to the external world appears only in the *subject-matter* of reflection, in the extent to which we image the *situation* contemplated, and in the possible bearing of our decision on subsequent action. For such occupation as this, the nerve-system is capable of rendering only slight service. Whereas, in external observations, the brain has a leading part to play; when we are engaged in reflection, activity of organic apparatus is largely in abeyance. Ordinary experience, depending solely on the test of effort, is conclusive as to the comparative superiority of thought, and comparative subordination of neural force.

How much may belong to Brain during protracted reflection, it is difficult to determine. Some phases of brain-action can be distinctly traced, while thought has precedence, for all concentration of thought involves large exercise of inhibition in the government of the body, that we may avoid distraction. Besides, the unity of life implies such close relations of the physical and mental, that we may be assured of active use of Brain in all our engagements, whether more prominently reflective, or directly concerned in physical effort. Nevertheless, the difficulty of determining the form and proportion of brain-action is great. The uncertainties here belong to the Physiologist; the certainties to the Psychologist. There is nothing more directly and certainly known than that for which consciousness bears witness, as to the exercise of our own thought, and the emotion rising and falling within us, as our reflections proceed. How much brain-work is involved along with exercise of Mind, we have no direct evidence to show; and there is little hope of a definite conclusion on this matter being attained by the methods of scientific observation. A limited series of inferences is, however, possible, in view of the laws of nerve action as now ascertained. For example, we may conclude, that feelings first experienced through the sensory, when

recurring in mind, stir to activity the nerve-cells concerned in our first experience. Again, the dependence of thought on language, and the closeness of relation between language and speech, make it probable that the centres of vocalisation are more or less engaged while we are thinking. But it will be observed that such forms of brain-action give *precedence to the exercise of Mind,* implying the independence of Mind, as they illustrate the dependence of brain functions on the antecedent exercise of thought. This relative independence of Mind is strongly confirmed by all that is involved in voluntary use of our reflective powers. If Mind waits on bodily activity for its knowledge of the outer world, Brain waits on Mind for direction of motor activity, in order that our conduct may be rational. The suspension of outward activity; the *waiting of the Brain* for orders from the governing power; and the protracted reflective process, while we are undecided as to the course to be adopted, present distinct phases of evidence which, when combined, supply proof of the Mind's relative independence of brain functions. Admitting suspension of the motor functions, and delay in the use of the central organ, the physiologist has no evidence to show that work, which eventuates in the exercise of thought, is being done within the cellular tissue. The relative independence of Rational Power in human life is as well assured as the relative independence of Brain Power. The unity of human life is not shown by evidence that all our activity is of similar character; or that the relation of structure to function, appearing in the physical life, is maintained in the phenomena of consciousness. On the contrary, there is a dualism in human life; there are two distinct orders of life, *each having its own centre*; and the unity of life is maintained only by security provided for independent action of the Mind, even to the extent of subjection of the physical power to its decisions.

Within the region of physiological uncertainties, there is still pending the question as to continuous persistence of brain-action, while the distinctive exercise of thought is proceeding. I do not propose to deal at length with the obscure phenomena, with which the physiologist is directly con-

cerned. We are all deeply interested in discovery of the facts, but whatever their number and relations, thought's independence of physical law, and its dependence on logical law, are facts beyond dispute. It devolves on the Evolutionist to show how, on a theory of continuity, it is to be explained that there are two distinct phases of action, each depending on separate conditions, each subject to its special laws, each completed within its own sphere, each having its own centre of activity; both centres correlated, but each relatively independent of the other. In the direction of all action properly named 'personal,' whatever its motive, the whole nature, including the Brain and its dependent apparatus, is controlled by the Rational Power, which constitutes the vital centre of our being.

To the psychologist, recognising a spiritual nature in man, and seeking to interpret the laws of its action, there is no perplexity here. He works within the sphere of consciousness, and with all the advantages of certain knowledge. The physiologist works in a different sphere, hampered by innumerable uncertainties. The psychologist, dealing with the facts of experience, analyses this experience to ascertain its contents, searches for the life-synthesis, the potency which gives unity to the whole, and finds it in Thought. If any physiologist challenge this procedure, he will be convicted of inconsistency, and effectually answered by the structure of his own argument, for he will exemplify in his own reasoning everything for which the psychologist contends.

The task lying before us, as we confront the theory of Evolution, is the elucidation of the characteristics of mental power, as these appear in ordinary human life. Evolution of organic life is granted, implying continuity of life, in the history of which advance is secured by slight modification in structure, 'descent with modification,' providing for appearance of new species. All this being accepted, as sustained by large masses of evidence, there is no obstacle to the encounter of the physiologist with the psychologist. We can further prepare the way, by indicating the points over which the dispute must be waged, which is to settle whether all the phenomena of human life can be included within the area of

physiology, or whether a new sphere of activity must be admitted, on account of our recognition of phenomena different in nature from those observed in physical action. The difference between the physical and mental, as contemplated by those who maintain the reality of a spiritual life in man, appears first in *Knowledge*, and next in *Action*. Knowledge is the primary and central fact; its possession implies the activity of Thought, and this activity is *sui generis*. In such an inquiry as the present, Knowledge may well be restricted to knowledge of the outer world, with which observational science is immediately concerned. Here the feature in mental action which may best have our attention is this, that human Intelligence somehow *turns on its own experience*, resulting from contact with the outer world, and interprets its feeling by reference to *quality in external objects*. This 'turning back' on its own feeling, in order to find its meaning, is the outstanding characteristic of our Intelligence. Human life does not merely include variety of experience, as all animal life does;—it does not merely imply succession in time, as when one feeling gives place to another; it does not merely induce action, as animal and man may equally be startled by sudden or sharp feeling; but it turns upon itself, to *explain* its impressions by reference to their source, and, in doing so, depends on certain laws of thought, recognised by all men, on the ground of which it attributes qualities to objects, not merely such qualities of taste as animal appetite may detect, or such attractive colours as animal sensibilities may distinguish, but qualities of proportion, form, and relation, thereby passing on to wide *inductions*, supplying us with general truths. These phases of human action belong to ordinary human experience; stated thus simply, they present a problem at once definite and easily handled.

Darwin's contention is that there is '*no fundamental difference* between man and the higher mammals in their mental faculties' (*Descent of Man*, p. 66). He relies on common observation for support of the position; but such observation, when analysed, shows his position to be untenable. If only we judge of the powers of man by the test of *his actions*, as we have hitherto done in the case of animals, it will appear

that there is a fundamental difference, and this so marked that every one sees it, and ordinary language bears witness to it. We all remark the difference between *rational and irrational conduct* in man; we never charge a dog or a horse with acting irrationally, simply because we cannot expect either animal to act rationally, it being impossible for it to recognise principles of conduct which are essential to 'right action.' Men are thus agreed that there is a fundamental difference between the mental powers of men and those of the higher mammals. Not only so, this fundamental difference is such as to place the two orders of life at vast distance from each other. This appears under every test that can be applied,—emotional, industrial, literary, artistic. These facts show that the Evolution theory is inapplicable to Mind, and thereby insufficient to afford a scientific view of its genesis.

Even after we have granted 'Animal Intelligence,' as established on conclusive evidence, and so have admitted that the genesis of Intelligence is a problem raised by the powers of the higher mammals, we cannot compare the higher mammals with man in respect of Intelligence, without granting a fundamental difference, completely separating these animals from participation in the rational power belonging to man. The consequence to Darwin's theory is well indicated in his own words, when considering how to uphold man's 'descent from some lower form' of life: 'If no organic being, excepting man, had possessed any mental power, or if his powers had been of a wholly different nature from those of the lower animals, then we should never have been able to convince ourselves that our high faculties had been gradually developed' (*Descent of Man*, p. 65). That it was needful for Darwin to apply this statement to the 'organic being,' in order to maintain logical relations with the scientific basis on which he leant, every one will see who has followed his line of argument. But this reference betrays the weakness of the position, when his purpose is to show the genesis of 'mental power.' The question is, Can such power be traced to organic structure? Is its action illustrated by the relations of structure and function? If so, there could have been no

occasion for marking out certain phenomena of action as we uniformly do, distinguishing between bodily power and mind-power, appealing to our own consciousness when we reflect—patiently think—as to what should be done in given circumstances. Knowing, besides, all that science has discovered as to the powers of organic beings, and all that we ourselves are able to achieve, on the one hand by a sensory system, on the other by a motor system, we know that we cannot gather knowledge, or carry forward long courses of reflection, or secure rational direction of conduct, if we use only our organic powers. We know that all our higher exercises depend upon a power within us fundamentally different from the energy belonging to nerve fibres, and muscular tissues, and to Brain. The testimony of our consciousness is, that in these higher exercises, whether brief or more prolonged, whether simple or more intricate, we use a power distinct from all the powers belonging to us as organic beings. This is the foundation on which we rest our references to 'mental power' as essentially different from 'organic power.'

It is on this basis alone that we distinguish between rational and irrational conduct in man. This distinction could not be maintained, if man did not possess a knowledge of principles of conduct applicable to motive, essentially distinct from animal impulse, with the psychological question how this knowledge has been obtained by man. While adducing evidence that the distinction has a non-organic source, and is inapplicable to the higher animals, I am not here concerned. In this psychological question, mental philosophy is deeply concerned; on it Kant has much to say of exceeding value to all thinkers. As a disciple of Kant, I have indicated my own position elsewhere at considerable length.[1] But the treatment of this ulterior question as to the source of our knowledge of right and wrong, or the mode of attaining certainty, need not complicate that of more general interest, with which we are now dealing. The distinction between rational and irrational conduct belongs to ordinary human life; and it affords a test

[1] *Handbook of Moral Philosophy*, p. 40.

of the Darwinian theory of the genesis of mental ~~power by~~ evolution from lower forms of life. When an animal seeks no other end than gratification of its appetite, using its force of muscular strength and of passion to drive off competitors, we do not blame it; when man seeks nothing but self-indulgence, acting in disregard of the rights of his fellow-men, and in violation of a principle of right conduct, we say he acts an irrational part,—a part unworthy of a man. He acts selfishly and cruelly. No one disputes these facts. Thus, in contradiction of Darwin's position, we recognise that there is a fundamental difference between the mental powers of the higher mammals and those of man. This being admitted, we are unable 'to convince ourselves that our high faculties have been gradually developed' from powers inferior in nature; that ~~rational~~ power is an evolution ~~from non-rational~~ power. The Evolution theory has been built up on the data of organic life; on this account it cannot apply to a life whose normal activity is essentially different, to a being who never acts as described in the case of the animal, without his action being unnatural.

Closer examination into this contrast between rational and irrational conduct affords additional evidence concerning the characteristics of 'Mental Power.' Our condemnation in human life of the action natural in the animal, is the more striking that animal appetite plays its part in human organism, just as in lower orders of organic life. There is in this respect no severance between animal and man. But, within Consciousness, the sphere of special knowledge, we trace also the presence of *a higher order of action,* in which the animals have no part, just as the animal life of man contributes nothing towards its accomplishment. This is the action of controlling power,—we name it Will-power. It operates ~~as a governing power *within thought itself*, exer-~~cising control, according to intelligence, over appetite as a physical impulse, thus making it possible to fulfil our obligations to others, by restraint and regulation of our impulse for self-gratification, as well as by active interest in the welfare of others, and loyalty to the rights of our fellows. However strange all this may be to the higher mammals, and quite

beyond their reach, it is the common exercise of man; and this difference, separating the two orders by a vast distance—by the whole distance which separates animal life from moral life—gives further explanation of the fact that we regard the action which is natural among the higher mammals, as unnatural and wrong in man. There is thus in human life a phase of antagonism to appetite which has no place in the animal, appetite being a function essential to the animal nature. This antagonism cannot have a place in the life of the higher mammals, possessed though they are of Intelligence, because 'animal intelligence' is so far inferior to rational power as to be unequal to the task. That Intelligence which generates antagonism to appetite is superior to that which merely interprets means and ends along the lines of instinctive action; it recognises principles of action,—general truths such as the duty of equity and of a fellow-feeling,—under application of which appetite is reduced to an incident in animal life, being subordinated to the law of a higher life, to be effectually held in subjection by continuity of effort, working from the days of youth, towards establishment of self-control. This conflict with passion is the familiar task of man, which is impossible even to the higher mammals,—an impossibility accounting for the fact that we include them without distinction with all lower orders, when we admit that action under impulse of animal appetite is 'the law of nature' in their case. This explains why we consider that a man has degraded himself, by his own voluntary act, when he acts as the animal does. His act differs essentially from that of the animal.

When, on the other hand, we consider how self-command is maintained, even in presence of strong appetite, we have further evidence of the superiority and relative independence of the Rational Life. There is in this a close analogy with the activity already traced in the acquisition of knowledge; for just as the rational power turns back on feeling arising from contact with external objects, so does rational power *turn back* on the impulse present in consciousness consequent on physiological conditions. To feel the power of appetite is as natural to man as to the animal; to control it

is as natural to him as it is impossible to the other. The history of this control is the ~~history of thought~~, and of its efficiency in directing conduct. It is because the dog is no thinker that he is incapable of acting otherwise than by animal impulse; it is because man is a thinker that he acts irrationally if he acts as a dog does. Yet is it only because there is an animal nature in man that he is capable of acting an irrational part, which the mere animal cannot do, for in man the irrational comes from disregard of the rational guide, from the action of animal power despite the better nature. If the relation between the animal nature and the rational in man be such as has been described, and if the difference between animal intelligence and rational intelligence be such that the dog and horse cannot act irrationally, as we can, these facts go to strengthen the conviction that rational power is no evolution from a lower order of life.

To complete our view of the antithesis, our observation needs to be carried a step further. How do we effect control over animal passion? The answer will show what is intended by saying that the power of the conscious life *turns back* on the impulse of the animal life. Appetite has its origin within organism, awaking feeling and desire within our consciousness. If this appetite fulfilled its part in us, as it does in the animal, it would dominate our life, would lead us forward to self-indulgence by its own independent force, and would waken angry passion against all other animals competing with us, and threatening to hinder us in self-indulgence. Man *can* act thus, for he is animal. This is the familiar practice of men of strong passions, who have not governed passion, but have unnaturally developed it, to the neglect of higher impulses, having themselves made their passions *unnatural forces*—such as do not so appear in the natural life of the animal—a force worse than 'animal passion.'

How, then, do we control passion? By the action of thought, in exercise of which appears the relative independence and superiority of the Rational Nature. ~~When appetite~~ urges us, we do not allow it to move forward under mere ~~physical conditions, as it would if physiological law were the~~ sole determinant. Thought, turning our attention away

from opportunity for self-indulgence, itself turns back upon the physical impulse, bringing it to the test of rational principle, so guiding attention, and so forming interest and purpose, that it becomes natural, as it is rational, to rule our conduct in the spirit of generous regard to the good of others. Thus a regulated self-gratification is gained in the vital harmony of physical and moral law. This turning back upon passion, so as to hold it in check, and to lead it, as the servant of rational power, is possible nowhere else in Nature than in the life of a rational being. Such action on man's part, being a check of physical force, by a power which we do not trace in the higher mammals, supplies evidence that human life discovers a new power in Nature, which comes into active relation with the powers of the animal nature, yet is independent of their force, and capable of imposing its own dominion over the life.

To complete the argument at this stage, I desire further to show how Rational Power appears in antithesis with Animal Instinct. The contrast is as marked here, though it appears in a quite different way, allowing to Instinct a relative superiority in some respects in determining action, because of its directness and promptitude, in contrast with the long deliberations in which we become involved in rational self-direction. Instinct, on account of its unreflective character, is akin to animal impulse, such as is illustrated in the stirring of appetite. It moves the whole nature, and moves directly towards a definite end. If, on these accounts, we attribute to it superiority to Intelligence in the sphere of physical action, this seems only natural, as Instinct belongs to the physical nature. Accordingly, the antithesis between ~~instinct and intelligence becomes marked,~~ as soon as we ~~notice that insects~~ excel the ~~higher mammals in~~ instinct; whereas the higher mammals excel insects only by reason of intelligence capable of interpreting signs for the *guidance* of instinctive action, as appears in the dog. To the recognition of this antithesis, Darwin leads the way, when, having remarked that 'instincts are as important as corporeal structures for the welfare of each species,'[1] he subsequently records the

[1] *Origin of Species*, p. 192.

observation, that 'the fewness and the comparative simplicity of the instincts in the higher animals are remarkable in contrast with those of the lower animals';[1] and further, that 'man, perhaps, has somewhat fewer instincts than those possessed by the animals which come next to him in the series.'[2] Thus the field of Instinct is severed by a well-defined boundary from the field of Intelligence. Taking Darwin's statements as affording a reliable record of the comparative features of lower and higher orders of life, it seems as if, roughly put, Instinct were in the inverse ratio of Intelligence, as Cuvier suggested, for Instincts steadily diminish in number and importance as life rises in the scale of being. This inverse ratio, it must, however, be observed, is in the *comparative distribution* of these powers of activity, according to which the life most largely distinguished by intelligence has fewest instincts. This does not imply antagonism between Instinct and Intelligence; but only that Instinct, distinguished as it is by directness and promptitude, is largely superseded by a higher power, which directs action by wider range of vision. Darwin does not profess to have found exact measurements of comparison in the cases alluded to; but he is quite explicit as to general contrasts, indicated by the diminishing number and complexity of instincts, in the ascending scale. At the same time, it must be noted that, when speaking of Insects, in which Instinct appears most conspicuously, he says, 'Those insects which possess the most wonderful instincts are certainly the most intelligent.' This, however, is part of his general theory, which attributes 'mental power' to 'one of the lowest fishes, as a lamprey or lancelet,' a theory which I have already endeavoured to show is unsustained by evidence. We are, however, left in no doubt as to his view of the relative importance of Instinct and Intelligence, since he grants that the former diminishes in relative importance as the latter gains.

The contrast between these two is further apparent when the *Classification of Instincts* is set over-against our view of Rational Power. The varieties of Instinct, their dependence on varieties of structure, and on the action of environment,

[1] *Descent of Man*, p. 67. [2] *Ibid.* p. 66.

as well as the periodic appearance and disappearance of many of them, are facts showing conclusively that Instinct is a power whose genesis is legitimately attributed to the action of Cosmic Law. All these characteristics disappear when we contemplate Rational Power, and with them disappears a large body of the supposed evidence for genesis of Mind by evolution from lower forms of life. As a consequence, Instinct cannot be regarded as in any sense the source of Intelligence, or even as any part of the agency which could account for its appearance.

In order to realise the full force of this reasoning, it is needful to observe how much scientific observers are agreed in holding that instinctive action is *independent of experience.* All agree in acceptance of Darwin's representation of it: 'an action performed by an animal . . . *without experience*, and performed by many individuals in the same way, without their knowledge for what purpose it is performed.' All such actions must be traced to 'innate capacities,' characteristic of the species,[1] and belonging to the living structure, under laws of heredity. Whatever difficulties beset our attempts to trace the influence of imitation, training, and habit in the life of Insects, and whatever diversity of opinion may be entertained as to the influence to be assigned to their effects, Instinct as a power is distinct from them all, explaining the marvellous activity of Insects, of which it is computed there are 100,000 species.[2] The instinct or 'innate capacity' of ants and bees, and again, among vertebrates, of birds and beavers, is acknowledged on all hands. This is a power whose presence is less marked in the higher mammals, and in man. We seem, therefore, warranted in inferring that if the activity known in our Consciousness could have been accomplished by increased complexity of organic instinct, this would have been the order of Nature; but in absence of the directness and precision characteristic of instinct, and in presence of cautious and critical observations, and besides of prolonged courses of thought, we conclude that Rational Power is a new power in Nature, for which 'the most remarkable and complete instincts' found

[1] Lloyd Morgan, *Animal Life and Intelligence*, p. 415.
[2] Huxley, *Science and Education Essays*, p. 283.

'among the highest invertebrates—especially among the insects, and of them pre-eminently in the social hymenoptera, ants and bees,'[1] show no preparation. When from this comparatively low level we pass at once to the higher vertebrates, agreeing with Darwin in acknowledgment of their possession of 'intelligence'; agreeing with him also in passing the anthropoids, because none of the higher apes has been 'improved or civilised as much as a dog has been in comparison with its parent form, the wolf or jackal'; selecting the dog as the best example of the lower type of intelligence possessed by animals; we still reach a similar conclusion, that there is not in such Intelligence as the dog has, any germinal appearance of that Rational Power which is the distinction of the human race. Now that the characteristics of this rational power are before us, the conclusion accepted at an earlier stage of this inquiry is confirmed. Neither by 'innate capacities,' nor by independent action, nor by the highest results of training when the animal has been 'improved or civilised,' does the life of the dog show a beginning of the reflective power belonging to humanity.

Notwithstanding all the disadvantages of doubt and debate; all the perplexities gathering around research, and protracted meditation, while we are 'looking before and after,' Thought lifts us clear of the narrow restraints of an Intelligence working only in companionship with animal instinct. Dependence on Instinct, men do own, as in their animal experiences: association also of Intelligence in the service of Instinct, while it guides our action, we are familiar with; but our thoughts pass beyond all this, even beyond the experience coming to us through manifold sensibilities, linking our life with all that is beautiful, grand, and even mysterious in Nature,—for these lift us into a region where we recognise order in all things, and the laws fixing the right for all generations of men; into a region of poetry where we feel all the pulsations of Nature; into a region of philosophy where we contemplate the universe of being as a whole; into the region of religious faith and fellowship, where in reverence and trust we worship the Eternal.

[1] Lloyd Morgan, *Animal Life and Intelligence*, p. 425.

Thus, Thought is the crowning feature in Nature, as it is the ruling power in human life. Its presence is that which makes our life noble and mysterious. Where Rational Power lives, the whole life is subject to it,—a power independent of all power besides, belonging to humanity, yet, in a thousand ways, too, dependent on all the other powers, physical and mental, which go to make up our complex nature. Feelings are manifold, Thought is in the midst of all; Instincts are varied, Thought is the central power, determining the outgoing of energy, under all its conditions, and also placing a restraint on this outgoing, such as is only faintly foreshadowed in the analogies of inhibition found in human life, even when physical life is at its best. This Thought-Power, working unseen in the centre of our life, is in association with all that belongs to our physical and mental experience; is in its activity running parallel with all the activities of our sensitive and motor system: a stranger to the mysteries of activity in the cellular tissue of the Brain, it moves from them with treasures of knowledge, moves towards them with the orders of a sovereign authority; parallel with all, it is much more than parallel, shooting beyond all else that belongs even to conscious life, that it may struggle towards fulfilment of its own Ideal, for which the combined sensibilities and motor activities of the most complex organism cannot supply the materials, far less suggest its governing conceptions.

CHAPTER XII

HUMAN LIFE

DISTINCTIVE FEATURES IN ITS DEVELOPMENT

Right and Wrong

In accordance with the evidence that the Mind, immanent in Body, is largely independent in action, and is dominant, in so far as it commands bodily action, excepting the activity belonging to the vital organs, I proceed to trace the characteristics of human life, which separate it from all animal existence, even the highest mammals when most 'improved and civilised.'

Throughout the previous Chapter, observation has been carried along the lines of activity peculiar to rational power; now we note the impress which Mind makes on the life-history of the individual. There is a marked difference here, from the results observed in the history of organic life. On the lower levels, we ascertain how, in accordance with cosmic law, *Environment* makes its impress on the sensibility of the living organism, so as to modify the structure itself, and thereby to amplify organic functions. On the highest reaches of activity, we see how *Mind* makes its imprint on the individual, how the man *makes himself*, whether for better or for worse, so that every individual of the race is in a sense a 'self-made man.' A vast difference here comes into view. Adequate illustration of it will greatly strengthen the inferences from previous investigations. When our observation is directed downwards, we see everywhere the dominance of Environment; when observation moves freely around on the level upon which man dwells, we see everywhere the dominance of Mind, 'freedom

of opinion,' and large consequences flowing directly from these opinions, which are not only accepted and cherished, but are made effective in guidance of the life, asserting themselves in social life. Nothing approaching these effects, or giving promise of the activity on which they depend, appears in the history of a dog or a horse. By reason of their intelligence, these two animals are brought nearer to us; they are capable even of co-operating with us; the dog enters even into a form of companionship which we value. But this closer approximation, depending on 'Intelligence,' as well as on superior organic structure, does not present any approach to the directness of self-command, which originates character in the rational agent. Even with the fondness we cherish for these animals, we are constrained to place them along with animals of lower order, dominated by Environment. Only to Man belongs the distinction of ruling his own life; and to him it is given only by possession and use of rational power. So obviously is this the test, that, neglecting to use this power, his life remains comparatively undeveloped; in misapplication of it, he falls beneath the rank which is his heritage; in persistent use of the higher gift of Reason, grander possibilities become apparent, which otherwise must have remained invisible.

THOUGHT is the distinction of Humanity. It is the outstanding feature of man's life. He thinks *about things,* about all things as they appear before him; his thoughts are linked with memories, and twined amidst expectations, for his is a life leaning on the historic past, as understood by him, and also a life inspired by hope, outstretching the past, finding in the present not merely breathing space, but preparation for a Future, into which he projects his own life-interests.

The characteristics of Thought, we now need to have clearly before us. Clifford has dealt so admirably with these in his popular lecture on *The Brain and Thinking,* that I prefer to give here his luminous exposition, specially valuing testimony from such a highly-gifted Professor of Applied Mathematics and Mechanics, recognised by all as a leader of thought. His exposition, coming after a description of 'the mechanism of the nerve-system,' first makes account of the parallelism between Brain-action and

Mind-action; between 'a series of purely mechanical processes' and 'certain other facts which go along with, and exist at the same time with, those purely mechanical processes,'—the facts within our own Consciousness. 'Many eminent men have been so much impressed by the exact correspondence between what goes on in our minds, and what goes on in our brains, that they have mixed up the two things; and they have used expressions such as to say that thought is a secretion, as if it were really a mechanical thing which was produced by the brain, or even a mechanical state of motion, produced by the motion of the brain, in the same way as other machines produce states of motion in other things. Or they have said that the mental force is correlated with the natural forces, meaning that it can be produced out of natural forces. . . . These eminent men have always been few in number, but we ought to speak of their opinions with the very greatest respect, though I think we shall find reason to say that we cannot even frame in thought any clear representation of their hypothesis—of the hypothesis, that is, that thought and mental facts generally are just a part of the train of material facts and can be mixed up with it.' There are 'two different ways in which a message might come from the outside, and go to certain muscles—it might either pass straight across the lower part of the brain, in which case the action is called instinctive, and in which case you move without being consulted, quite suddenly, without making a choice what you will do, or what you will not do; or else a message may come first to one of the little pieces of grey matter, and then may go up to the top of the cerebral hemisphere, and then come back again to the other one, and then go on to the muscles. . . . Then you have the feeling that you have exercised a choice about that motion; that it is you that have done it, and that you have *deliberated* about it. . . . Nobody knows exactly what is the sort of action that goes on in the brain when we feel pleasure in any sensation; nobody knows precisely what happens when we feel angry. . . . The mental facts go along with, and parallel with, disturbances taking place in the brain, and not in any other part of the body. . . . In all these

cases, we have to make in our minds a rather simple connection between a message that comes in, and the action which is to follow from it.' Getting beyond this, we form 'that which we call *a proposition* . . . and that does not merely connect one particular *sensation* with a particular *action* that is to follow from it, but it is combined with an almost infinite variety of sensations, which will indicate what is the particular action to flow from each of them. . . . We do not know what the physical counterpart of that is. . . . We think, not in pictures, but in words, for the most part, and it is those words which have enabled us to make a great many steps further than the mere simple step of a proposition—the combining together of a great number of sensations with a great number of actions. . . . We form, then, not only propositions, but also *general conceptions*. As soon as we have given a thing a name, that name does not belong to the individual thing, nor to the individual group of sensations which we get from it, but it belongs to every other thing which is like it. . . . A name, therefore, cannot possibly be attached to any particular sensation which I get from the thing, but it must be attached to a grouping together of all possible sensations which I could get from it, and the actions which I could perform towards it. . . . Now the wonderful thing to remember here is, that the world in which we all of us live is not made up out of those individual sensations of objects for the most part, but it is made up out of the general conceptions. . . . It is the thought of past humanity imbedded in our language which makes Nature to be what she is for us; and the world in which we live is a world of general conceptions, and these are determined by language and expressed by signs. If the way in which these general conceptions are bound together has been determined by the previous thought of society, it follows that our ancestors have made the world to be what it is for us—that is to say, what it is to all those who have studied Nature, whether as scientific men, or as artists. They have felt that out of the things that they studied, something like a similar intelligence was looking at them.'[1]

[1] *Seeing and Thinking*, by the late William K. Clifford, F.R.S., University College, London, pp. 88-111.

Such is the story, vividly and strikingly told, of the unfolding of human life on its way to the understanding of its environment, including the powers it wields in midst of the fixed conditions of existence. It is a story, illustrating in every line of it, how little credence can be given to the theory that rational life is an evolution from a lower life. The description is one presenting more in detail the action of mind to which I have referred, in the previous chapter, as the turning back of the mind on its own experience, and the interpretation of that by reference to the qualities of objects around. This distinguishing characteristic of a rational life appears, at the earliest view we can have of it, in the primary function of Thought which is central for all mental phenomena. Observations, propositions, general conceptions! Where, besides, can we trace participation in the exercise which produces them? We turn in vain to our 'animal congeners' for promise of this rational power.

No doubt there is in our life, as in all animal life, much that is instinctive, much movement, as to which we have no choice; and even when our muscular movements are voluntary, we trace in these actions only comparatively slight indications of the powers within us. It is in Consciousness itself, antecedent to our voluntary movements, that we distinguish between impressions made on us, and possible actions which may be done by us; judging between the experience we have, and the causes which explain it; and forming for ourselves conceptions of things, and the purposes to be accomplished. In their nature, and in the laws of their procedure, these forms of exercise stand in contrast with sensibility, instinct, and animal intelligence. All these three, even when united in the action of a single life, as in that of the higher mammals, leave that life at a vast distance from human life. 'Animal Intelligence' supplies no aptitude for seeking knowledge for its own sake, no power to use general conceptions for interpretation of the order of Nature, no fitness for guiding life in view of higher principles commanding the reverence of men.

In instituting these comparisons between ourselves and the higher animals, we must not overlook a certain superiority

allowed to Instinct, on account of its directness and precision. In the inner movements of thought, when our physical nature is of least concern to us, we not infrequently pass into an entangled undergrowth, through which it is hard to cut our way, harassed with doubts, uncertainties, and fears, to which the living creatures around us are strangers, blissfully ignorant of our troubles. Our thinking is not always correct, therefore not always trustworthy. Our reasonings are liable to become the jest of our Reason; even our Logic has its book on Fallacies. We have, therefore, good reason to own the troubles to which a rational life is exposed in its search for truth and right. We see and admire the precision with which a bird, or even an insect, acts. But this superiority of Instinct is not superiority of Life. In the inadequacy of instinct to deal with our difficulties, we learn how much higher is our power, and wider our range of activity. It is with Instinct as a guide of life, as Kant has shown it is with desire of happiness, when that holds sway. Both are direct in their application—they move towards a single end —but it is the singleness of this end, with the temporary value it has in life, which shows the inferiority of the Life ruled by either. Even man straightway becomes lower, if he is ruled by desire of pleasure, as the animal is swayed by it. Desire of pleasure acts as instinct does; its narrowness and impotence appear in the nature of the end achieved by it. So Nature distinguishes between instinct and reason, as lower and higher; life is on a higher plane, as it is ruled by the latter. 'In a being which has reason and a will, if the proper object of Nature were its *conservation*, its *welfare*,— in a word, its *happiness*, then Nature would have hit upon a very bad arrangement in selecting the reason of the creature to carry out this purpose. For all the actions which the creature has to perform with a view to this purpose, and the whole rule of its conduct, would be far more surely prescribed to it by instinct, and that end would have been attained thereby much more certainly than it ever can be by reason.'[1] In fact, Instinct is fixed in organic structure, to operate in accordance with physiological law, to the utmost measure in

[1] Kant's *Metaphysic of Ethics*, chap. i.: Abbott's Translation.

which organic impulse is equal to the ends of life. When a higher power appears in Nature, it is as certain that the ends to be attained are greater, as that the functions are superior. Thus the main question in dispute is whether organic structure and function are equal to the production of thought, and to the realising of rational ends. It is because Thought is so far above organic action; because deliberate observations, rational conclusions, general conceptions, and appreciation of the orderly system of Nature are so far above Animal Intelligence, that it becomes impossible to recognise that rational life is an evolution from lower orders.

Contemplating Thought-power as the distinctive feature of rational life, we are now to consider the special phases of Life naturally emerging wherever this power is at work. It is on this high plane that all the distinctive features of human life appear; on the lower plane of organic life are traced all the features showing our place among the animals. To distinguish man the animal, from man the rational being, becomes a necessity for science, in recognition of the distinction between two sets of phenomena, physical and psychical, appearing in combination, in all the ordinary occupations of our race. And yet it is required, in making this distinction, that we hold to the unity of our life; for this is the fundamental conception to which science must be true, while we trace and illustrate differentiation.

The grand distinction of human life is *Self-control in the field of action.* Thought not only reaches a generalised knowledge of existence, and of its laws; it leads to rationalised action, within the many and varied fields of human endeavour. The evidence of this appears, as already described, in the control exercised over all the animal impulses, so that these do not spontaneously and of themselves determine activity. Sensibility operates in human life, just as in the life of the animal; but it does not at once direct our action, as the course of the dog is ruled by sense of smell. Sensibility can influence us in the same way, and a similar result is often seen in our life; but that which is peculiar to man is a concentration which overcomes allurements of sense. Animal appetite is stirred in us, as in animals, physiological

law being co-extensive within the animal kingdom; our specialty appears in the regulation of animal impulse, so that it is repressed, in accordance with the laws of attention, which weaken or strengthen animal propensity; or limited, by reference to propriety; or regulated in its indulgence in recognition of a law higher than present desire. These facts are so familiar, that I have only to refer to them to claim their weight of evidence for a power which does not appear in animal life. The value of this evidence will be still more appreciated, if it be observed that the control of animal impulse no more belongs to the animal nature of man, than it belongs to the animals around him. In respect of animal impulse, his experience is as much determined by physiological law, as animals are visibly moved by it. Man being an animal, no one can suggest that the movements of animal impulse are otherwise determined, or have their source elsewhere than in the body. The difference between man and animal appears in this, that by thought and imagination, passion may be intensified; and by use of these powers, it can be restrained. Even within the sphere of passion, the elevation of human life is seen in the control the rational power wields over the animal nature.

There is no diminution of the value of this testimony from the fact that a power of *inhibition* belongs to all animal life. Such power is, indeed, possessed by every nerve-system; it belongs to the physical life of man just as to other organisms, low and high. Every living being is able not only to use its motor powers, but also to check their action. In this respect, it is with man as it is with the animals around him. When running at high speed, a man can swerve quickly to right or left, or put immediate restraint on his advance, when an obstacle to progress suddenly appears. But he does not in this show his superiority of Intelligence; no one points to such illustrations of control, when speaking of the *special* command we have over our actions, and more particularly over what we more properly describe as 'human *conduct*.' This contrast, indeed, between activity and conduct, in everyday usage, marks the distance which separates organic inhibition from rational command of oneself. At the same

time, the unity of our life appears in the vital coherence of body and mind; inhibition, as a characteristic of physical life, gives to the rational being the needful physiological aid in governing physical energy according to the requirements of a moral life.

This incidental allusion to physical restraint serves to make more conspicuous, as a quite special thing in Nature, that dominion which a rational being exercises over all the efforts and restraints incident to organic life. Restraint under force of fear, through inhibition of motor energy, is a common characteristic of animal life. Human life offers no exception in this respect, and enjoys no advantage under physiological conditions. The specialty of human life is, that it utilises physical inhibition in ways impossible to the most highly 'civilised' animal, restraining animal passion under regard to propriety, interest, and duty. We do not expect such results in the action of our best-trained animals, though we do trust not a little to the power of the whip, and to the force of a threatening tone, believing as we do in the power of fear. It is a different power—quite different in nature—which plays its part in Self-regulation, when, on rational grounds alone—for it is inconceivable on other grounds—we place a check on animal impulses, refusing to have our life dominated by these, even while granting that they are natural to the physical life we have inherited. We are not exalting man in all this; we are only interpreting the phenomena of his Life, present in individual experience, as these indicate the conditions on which personal responsibility is upheld in society. The testimony on which we rely is supplied in clearest form by the ordinary life of man. We speak of Man as an animal, and so we must continue to recognise his position in the Animal Kingdom—a place now more clearly understood and interpreted, than ever before—but even at the very lowest representation which observation warrants, we must speak of the 'human animal'—'the humanised animal'—'the rationalised animal.' All these three are required to give full expression to the truth. Whether we contemplate the undeveloped man, the deteriorated man, or the highly cultured man, the Rational Power is central in his Life.

The early forms of our argument, and the ends to be served by it as a whole, make it preferable that our references here should be to the undeveloped, uncivilised man. The evidence desired may be readily found in such a prevailing disposition as Revenge, characteristic of barbarous tribes. We select this test the more readily, that 'animal fight' is the conspicuous feature on which attention is concentrated, when demonstration is offered of the 'struggle for existence,' and 'survival of the fittest.' In tracing this analogy, the antithesis will become more visible. How little distance we travel into the comparison, until the antithesis becomes more obvious than the resemblance! For is not 'animal fight' the fight of passion, and is not this fact the basis of the theory of Evolution? Is not the fighting of barbarous tribes—often enough, too, fight waged with unequal odds against civilised nations—maintained on complaints of injustice, imaginary or well-founded? Claims may be warranted, or may rest on ingenious falsification of occurrences; but, in either case, the mere understanding of them, and avowal of their validity, whether in feats of oratory, or in appeals to the arbitrament of war, supply evidence of a regard to personal or tribal rights, and some sense of a power higher than the power of numbers, or the force of a disciplined army. In all history, a difference has been recognised between misfortunes, and wilfully inflicted wrongs. Even the least civilised see this difference, and found upon it in their disputes. Let us say that these barbarous races are degraded specimens of humanity;—we need to say it, in order accurately to describe the situation; let us admit that animal passions come fiercely to the surface, as they do, in all war, civilised and uncivilised; nevertheless, in the mingling of revenge with outcry against injustice, commonly a mingling of the bad with the good, we see a regard to rational law, which separates these struggles of humanity from the brute conflict on which evidence of 'the struggle for existence' rests. Animal impulse is not the centre, but the circumference, of human life; the Rational Power is not the adjunct of animal force, but the source of activity in the history of human effort, even when animal

passion mingles largely with regard to the 'right' and to 'vested interests' giving antecedent claims.

That in these things we mark *common characteristics* of the race, appears in the fact that social organisation, from its most primitive forms, shows evidence of the power of a rationalising life. Whatever the state of civilisation, or of barbarism, no two things are more uniformly present in social life than fight and law,—struggle against the encroachments of other individuals, or tribes, or nations; and rules for guidance of those who belong to the same community. Both indicate, as a common feature of life, the need for defence against encroachment, the first against a common foe of the tribe, the second against the selfishness which seeks personal gain at the cost of another.

First I take Fight, keeping nearest to the analogies of animal life, so saving us from assuming a severance which does not exist. Thus much there is here to favour the Evolutionist, that the fighting spirit, apparent in animal life, is continued in human life. That all fighting has in it animal elements, we have already recognised; and we must even admit besides, in human warfare, evidence of animal ferocity, aggravated by evil passions, which disfigure and disgrace the rational agent—'much of the devil in it,' as was said by a survivor of the Balaclava Charge. The most violent passions of our nature are raging in the midst of the fierce onsets between contending hosts. But that which is to be marked as special, is that there is something *ethical* present, and this at the early stage of the contention, before angry passions are raised and raging, when, under constitutional government, diplomacy is doing its part, and the national mind is concerned with claims of equity. Even when we see that a spirit of Revenge has begun to burn, and that men complaining of wrongs are preparing to inflict wrongs, still the ethical element is present from the first, directing thought, feeling, and purpose. The complaint against wrong, rests on the acknowledgment of the 'right,' and of consequent obligation. There is no dislodging of this general conception of Equity, without bringing down the whole social edifice. The significance in Revenge is deeper

than passion: it is found where thought rests on a foundation of duty and natural right. Thin away this ethical element, and the earnestness of effort disappears; everything comes either to brute passion, or to pageantry and mock heroics. On the battle-field, mere parade is over; intense earnestness prevails. It is the deeper significance in Revenge which lifts it away from mere individual passion, surging round individual wrong; for that shows regard to moral distinctions at the root of all our disputations. It is this fact, distinguishing punishment of wrongdoing, from gratification of angry passion, which gives to the fight of human life a deeper significance than belongs to animal fight. Common language supplies witness to the accuracy of this representation, bearing on its surface everywhere this wider and deeper significance. The angry passion belongs to the organism, which is on its way to dissolution; the sense of right belongs to a rational life, superior to physical conditions, feeling more or less that it has a place in a Spiritual Kingdom.

The serious entanglements inevitably arising in the midst of our disputes are many, involving admixture of evil with good in all encounters. Even under an advanced social organisation, the Executive may not always have a clear conception of ethical warrant for all that is being done; nevertheless it holds true, that equally under the simplest, and under the most complex, organisation of society, there is always some regard to the sense of right and wrong. In all human contentions, there is some deeper meaning than appears in the details of local disputes over which men wrangle. It is the Sense of Right which lies at the basis of all the nobler sentiments of our race,—sentiments which have no place in the catalogue of emotions, confusedly and confusingly attributed to animals (p. 104). It is this sense of right and wrong which gives a permanent rational interest to the great contentions which have arisen among the nations. It is this which gives vitality to all our human aspirations, however unworthily shaped, and inadequately expressed in daily language, and however poorly realised in individual and national history.

The fact that such an element can be present in the

humblest life, and in the most primitive type of social organisation, is a valuable contribution to the evidence that Rational Power is no evolution from animal impulses. It is a power which has in it, from the first, a depth of significance, which takes ages of thought, and effort after social organisation, to realise. Only at such great cost of effort can the significance of human conflicts be unfolded; just as it has cost ages of animal struggle, to bring out the potentialities of vital organism, developed even from a germ-cell. When cosmic law, organic life, and rational faculty are gathered together, we learn that the amplitude of power in Nature has been discovered in history by accessions of new agencies introduced at well-defined stages. There is, indeed, much that is transitory in the history of Nature's advance, but there is, most surely, in the midst of all, the enduring; and, the higher we rise in the scale of being, the more enduring are the results of achieved progress.

It is thus apparent that an ethical element is present in all human contentions, that moral obligations are recognised and insisted on, and that a sense of right and wrong lies underneath the complexities of our thought and feelings, and comes to dominate them in the calmer exercise of reflective power, largely controlling national thought in the supreme crises of national history. These characteristics of human life must, therefore, present the real test of an Evolution Theory, when it claims to be all-embracing. Darwin's efforts to grapple with the difficulties here arising do not carry us far into the great questions involved. He is still naturally occupied with comparative observations, and that to such a degree as to fail in adequately measuring the distinctive powers of man. Herbert Spencer is the thinker who has devoted himself with most persistence and acumen to the task of elaborating a theory which may include rational endeavour. He is more directly in contact with the evidence, and with the difficulties of the argumentation, when we are concerned exclusively with mental phenomena. The difference between Darwin and Spencer at this point arises largely from the fact that the former is concerned with *structure*, the latter with *action*; but Spencer's danger arises from this,

that in attempting a more exalted view of action, he is apt to forget that it is a theory of *structural* advance which has supplied the foundation on which the theory of Evolution is resting. In old Scottish baronial architecture, certain overhanging turrets may be allowed, but these must not exceed the weight which the inner structure can endure and readily sustain.

The vast proportions of the 'Synthetical Philosophy' of Herbert Spencer may suggest to a reader that, under the present criticism, he is about to trace his way through intricate labyrinths of underground exploration. But it is not so. Herbert Spencer's *Data of Ethics* is both brief and lucid, so that a judgment of its merits, as a treatment of the Ethical Problem in human life, may be formed almost as readily as we can judge of Mill's *Utilitarianism*. Mill sees more clearly, and feels more deeply, the perplexities to be encountered in attempting to reach a philosophy of personal obligation and responsibility. He calls a halt before the grand question, 'Why am I *bound* to promote the general happiness? If my own happiness lies in something else, why may I not give that the preference?'[1] He admits that this will always be a difficulty, till men cease talking about duty, and do it as their truest happiness. This not being a present achievement among us, Mill resumes his philosophic march with some misgiving as to his having conquered this fortress. Herbert Spencer has sense of greater comfort in looking up the line of progress, as if a long open staircase led quite to the summit of the citadel; nothing more seems required of the philosopher, than that he should quietly and patiently climb, step by step, instead of having to cut his way through scrub, and to plant ladders against the solid rock on which the fortress stands.

An understanding of Herbert Spencer's view of the essentials of ethical thought and action is easily reached. His general proposition is this,—'Ethics has for its subject-matter that form which universal conduct assumes during the last stages of its evolution.'[2] Such a clear and concise formula

[1] Mill's *Utilitarianism*, p. 40.
[2] Herbert Spencer, *Data of Ethics*, p. 20.

has great value, but it has to encounter the tests presented by a wide range of facts to be explained. The first difficulty lies in this, that it is not universal conduct we are dealing with, but exclusively human conduct, when and where that is quite distinct from all action besides; we are specially considering that form of thought as to conduct, which leads us to ask Mill's question, 'Why am I bound to promote the general happiness?' This is Man's question; no animal could formulate it; and, on this account, it is a question which cannot apply to universal conduct. Thus, the antithesis between evolution and obligation is pressed into notice. Where there is Evolution, there is no obligation; there is necessity, cosmic law and organic energy providing for accomplishment of Nature's purpose. But where there is Obligation, there is liberty; action depends on thought; Nature's purpose now waits on man's will, as it previously waited on slow advance in organic differentiation. There can be no success in constructing a science of Nature if we shut our eyes to Mill's question, 'Why am I bound to promote the general happiness?'

As soon as this question has been raised, and its rational force acknowledged, we see that animal action, to which it cannot apply, can have had no part in the genesis of the Life to which such a question is a necessity. It might as well be suggested that a water-wheel produced a steam-engine, both being essentially dependent on water. We do not run tilt against the water-wheel, because we prefer the steam-engine. Both are good in their place, and are to be valued accordingly. Hence we can agree with all the earlier positions of Spencer, and agree with many of the later positions too, though we cannot admit that a line of continuity runs through them, so as to explain the advent of Rational Power.

How large our agreement is with Herbert Spencer's earlier positions can be readily shown, while disputing the position, that 'conduct is a whole, and, in a sense, it is an organic whole—an aggregate of interdependent actions performed by an organism.' A statement of such generality is fanciful; it is the product of hypothesis, not of observation. But the 'evolution of conduct' is an important branch of observation

connected with 'evolution of structure.' No one will dispute the vantage ground which Spencer holds on the field. In the sense in which evolution of structure is a unity, in that sense evolution of conduct is the same. But evolution of structure is not evolution of an 'organic whole,' neither can the evolution of conduct be so described. In this appears Darwin's superiority, in adhering to structure as the test, finding in action the illustration of structural advance. Nevertheless, the fact that structure and conduct are related in nature, gives Spencer clear warrant for a distinct study along the lines of vital activity. We follow with pleasure through all the earlier stages of his reasoning. During these, the accuracy of his representations will be admitted. The simplest activity in animal life shows 'combinations among the actions of sensory and motor organs'; advance appears in 'the addition of new sets of adjustments'; when we include the higher mammals, 'the adjustments of acts to aids are both more numerous and better'; with more 'advantageous adjustments,' 'there goes increased duration of life'; and beyond this, we mark 'adjustments which have for their final purpose the life of the species.' In all this we are agreed.

We are specially concerned, however, with the significance of the facts in Spencer's view—*first*, as they are supposed to supply a scientific account of the Ethical Element in human conduct; and *second*, as they are held to warrant a general interpretation of the Order of things in Nature. In both of these respects, this theory seems to me unsupported by evidence.

I take first the explanation offered as to the recognition of moral distinctions, the sense of right and wrong in conduct, the obligations and responsibilities of human life, and the virtues of human character. To supply an explanation is the direct purpose of the *Data of Ethics*, in which the author proposes to answer this question,—'What distinction is habitually made between the conduct on which ethical judgments are passed, and the remainder of conduct?' He begins by seeking 'the essential meaning' of the words 'good' and 'bad,' specially when 'from lifeless things and actions we pass to living ones.' He finds that the words

'refer to efficient subservience.' Actions are thus approved as good, when they subserve individual life, life of offspring, or, among men, the general interests, by 'acts which further the complete living of others.' All these are clearly accurate representations, both as to the facts of life and as to the meaning of the words by which we express our judgment on things. But they do not carry us any way towards an explanation of the ethical element in our thoughts as to right and wrong, and in our judgments of the conduct of others. They are mainly statements applicable to animals as to us—applicable to us as to animals; but they do not show how ethical law comes into view, and applies in human life, while it does not so apply in animal life; how it happens that animal life is governed exclusively by laws cosmic and physiological, while men are governed by ethical laws besides. The 'data of ethics' are not even under observation, and are not interpreted and explained. Mill's question, 'Why am I bound?' still waits an answer, and Spencer seems no clearer, or surer of his ground that Mill was. Supposing that we, possessing the educational advantages which modern physiology has supplied, see more clearly than previous generations did, as to what is required for 'the furthering of the vital functions' of man, how is it that we 'tacitly recognise' all these vital functions as 'special ends which ought to be fulfilled'? This is Spencer's unanswered question, and the answer is precisely the thing now wanted, if we are adequately to interpret man's life. There is an essential difference between the good, in sensory experience, and the good in conduct, determined under rational law; between the good which is the agreeable to us, or to any of the other orders of life around, and the dutiful, as known to man, and possible only within human relations and efforts. Our knowledge cannot be traced to repetition of sensory experience, or to repetition of animal actions, dependent on physical structure. There is here a barrier lying across the path of the Evolutionist which he is not surmounting, nor can he do so, except by showing how the agreeable grows into the right; how desire is transformed into duty; how thought is antecedent to feeling and purpose; how thought as to right conduct has

gained its knowledge of a law whose fulfilment is an obligation. Even when men are nursing a revengeful spirit, they are complaining bitterly of the wrong inflicted upon them; the whole human race is to-day anxiously concerned in the righting of these wrongs. It is in vain that we turn to the dogs, and the rodents, and the lancelets for primitive forms of the sense of duty. The longer and more deeply we ponder the facts in our own life-history, the more clear does it become that this knowledge of the right must be classed among the native gifts of a rational nature; that *Conscience* is a voice sounding within a rational life, appealing only to conscious intelligence, and unaccounted for in the *Data of Ethics*.

Herbert Spencer's theory of the distinction 'habitually made between the conduct on which ethical judgments are passed, and the remainder of conduct,' seems to me inadequate. I have further to urge that his general interpretation of the Order of Nature is erroneous. Right conduct is not produced as motor activity is; right actions are never reflexes; there is here a region of thought lying between an impulse and an action; a law of thought, which is also a law of action, supplies the basis of ethical action. Account for it as we may, in our philosophies, we cannot roll all this into the energy common to organic life. Ethical law could not come thence. Natural history does not sustain Spencer in saying that 'conduct is a whole, and, in a sense, it is *an organic whole*—an aggregate of interdependent actions performed by an organism.'[1] That Nature is a unity we all recognise, but not such a unity as is here implied. That there has been continuity in organic evolution; that, in the history of the ages, there has been evolution of species; that there has consequently been a steadily increasing number of persistent orders of life; and that their separate conditions have been provided for under general cosmic laws and under specific laws of heredity, are all of them conclusions which science has established. But these positions, that all conduct is 'an organic whole,' that all actions are 'interdependent,' and that 'universal conduct'

[1] This criticism applies also to Mr. Leslie Stephen's 'social tissue,'—*Science of Ethics*. Society is an organised growth, without being an 'organic growth.'

at length assumes an 'ethical form,' are not readings of natural history, as they are not conclusions recognised by modern science, because there is no organism to which we can point, whose structure provides for all the activity in Nature. If it be said that Nature is a unity, the answer is clear, Nature acts only indirectly, and by diverse agencies.

We agree with our author when he says that 'by comparing its meanings in different connections, and observing what they have in common, we learn the essential meaning of a word'; we gladly accept popular usage as a testimony as to the nature and bent of popular thought. But, in following the account given in the *Data of Ethics*, we do not find that the meaning of the notion 'good,' at once the deepest and most fruitful of practical results, has been adequately presented. A like deficiency appears in dealing with the word 'conduct.' If we are to interpret Nature, specially if we are to reach a true appreciation of its grand unity, we must gather into unison physical forces, organic energy, and mental power as essentially different in nature; and we must trace 'purposive activity' in each one of them, though each reaches its end in a distinct way. Even if it be not an organic whole, there is in Nature a grand unity. But, in treating of the ethical in life, Spencer either unduly restricts our view of 'action,' by excluding Nature's blind forces, or unduly expands our view of 'conduct,' by including organic functions. Taking 'conduct' to apply to all animal activity, he says, conduct excludes purposeless 'actions'; includes 'acts adjusted to ends or use'; conduct is 'the adjustment of acts to ends.' That we do rightly distinguish between 'action' in nature, and 'conduct' in life, is readily admitted; and we certainly keep closer to usage, when we speak of 'organic action' in contrast with 'ethical conduct.' But, are we not accepting an unduly narrow view of Nature, if we acquiesce in exclusion from it of any forms of motion? Are there *any* 'purposeless actions' to be excluded from consideration? Does not all movement in Nature tend to a result, which science interprets? Is it not a quite essential thing that this be constantly present to our minds, as we contemplate the lessons of natural history? We have seen that there is

discrimination and purposive action in the movement of the germ-cell, as there is in the swelling and growth of the acorn and of the pine-cone, and in the sprouting of the buried seed, as if it were a sentient being, answering to the moisture and warmth of the spring. If we are to hold to an Evolution Theory, as a theory of the advance of organic life, it is impossible to exclude any phase of movement in Nature from the agency at work. It is inconsistent with our conclusions as to 'origin of species,' as to 'laws of heredity,' and as to the 'individualism' of the animal 'struggle for existence,' to suggest that the general 'blind' forces of Nature are not purposive; for all bear witness to one grand purpose, persistent throughout the ages. But an Ethical Life, with its regard to moral law, its sense of Right and Wrong, and its striving towards an ethical ideal, is quite severed from all the characteristics of a purely Organic Life; and rises quite away from all the phenomena of Intelligence appearing in the life of the higher mammals.

CHAPTER XIII

HUMAN LIFE

DISTINCTIVE FEATURES IN ITS DEVELOPMENT

Civil Law

I TURN now to a wider survey, including the regulative and defensive aspects of human life, as these show the consolidation of society, and the gradual extension of security. Observations of human conduct have led us to mark how constantly 'fight' and 'law' appear under all phases of life, whether in barbarism or in civilisation. It remains that we should consider how regulation of individual conduct is associated in social life with defence of individual interest, in order to secure a common good. Whether we contemplate primitive tribal government, or more elaborate forms of civil order, the fundamental conceptions swaying men in their recognition of civil authority are the same. Hence every phase of organised social life throws light on the characteristics of a rational existence. Civil law gives further evidence of the force of ethical thought; for such thought is always authoritative, and is thereby the precursor of legal institutions. Whether Law is unwritten or written; whether arbitrary or consuetudinary; whether marked by primitive simplicity, or bearing traces of a long history, testifying to deliberate consideration of the conditions of social life, and resulting in the codification of an elaborate system, there is testimony for a steadying power in history.

The ends of our present inquiry will be best served by going back to the earliest traces of law in the history of our race, connecting with these such additional evidence as to the common characteristics of human life as can be gathered from the social order of semi-civilised, or even of barbarous tribes. In such an argument as this, we cannot rest contented

with the achievements of our modern civilisation. We desire to strip off the results of an advanced organisation, as this becomes needful for a view of the essentials of social life. The vast system of Law, representing the labours of generations of skilled jurists, which has brought to Western Nations the advantages secured to a law-abiding people, had its root in the simple adjustments of a primitive social life, followed up by slow accumulations of experience. In our study of the scheme of Evolution, we must, therefore, be largely indebted to those who have made the History of Law the subject-matter of scholarly research. In no way more effectively can we hope to see man working according to his native tendencies, in the use of his natural powers, than when we trace the characteristics of the simplest social organisation. The initial requirements are admirably stated by Sir Henry Maine: 'If by any means we can determine the early forms of jural conceptions, they will be invaluable to us. These rudimentary ideas are to the jurist what the primary crusts of the earth are to the geologist. They contain, potentially, all the forms in which law has subsequently exhibited itself.'[1] These words will command the assent of all who have directed their attention on the great questions involved in the natural history of the human race.

The proverbial dryness of legal studies is escaped, as we trace the expression given by men in early times to their wants, when they had not even the faintest dream of the formalities of legal procedure. It is in the simple forms of primitive life that we are to find the *essential* conditions of social life. It is not in Roman Law, greatly as that has influenced all Western jurisprudence, any more than it is in the philosophic thought of Greece, that the lines of evidence we are now seeking can be found. It is not even in the Ten Tables of the Roman Decemvirate; not in the rule of Tarquin or of Tullus; not in the laws of Solon, that the object of our search can be discovered. We must travel beyond these Codes, to find earlier and simpler phases of thought, which we seek to have interpreted in true historic spirit.

[1] Maine, *Ancient Law: its Connection with the Early History of Society, and its Relation to Modern Ideas*, p. 3.

Having regard to the antiquity of man, we are carried back over a great distance in time. We pass quite away from our long array of institutions; away from all our vast appliances, educational and industrial, to look upon Man when he had only Nature's education and training, and only the roughest tools for execution of the work he desired to accomplish. But as we look around on the situation of things here, there is the family dwelling, and there are other forms of family possessions; the relations and boundaries of tribal life; the chief and his councillors; and there is an established order in a simple primitive phase, which the tribesmen are accustomed in some measure to honour.

As we look back from our own standpoint to any such social life as that now described, we are impressed by the analogies with modern times, appearing as we pass ancient civilisations. Such analogies bring the civilisation of ancient Greece into close alliance with that of modern Europe, the expansiveness of Roman power with that of America and the British Colonies. The value of these analogies is not diminished, but is rather increased, by the marked differences which separate ancient from modern times. While noting such analogies as thus appear on the wide pages of history, we become impressed with the comparative insignificance of all our *time* measurements. How long-drawn is the vista down which we are gazing, in our search for primitive life! The sense of this enhances our estimate of the value for our present investigations of the contemporaneous life of uncivilised tribes. Once again, as so often before, Nature's perspective is presented in miniatures. We are more certain of the distant, by reference to that near at hand, which is made visible within small compass. We have Nature's illustrations, laid alongside us, to aid in our understanding of the remote. Aided in this way by Nature herself, we reach also a more adequate conception of the unity of our race, while we are enabled better to see the *root-thoughts*, which have been the same in all ages. That which appears in the structure of language reappears in the structure of history. Maine's words are suggestive here.

'It is certain that, in the infancy of mankind, no sort

of legislature, nor even a distinct author of law, is contemplated or conceived of. Law has scarcely reached the footing of custom; it is rather a habit. It is, to use a French phrase, "in the air." The only authoritative statement of right and wrong is a judicial sentence *after the facts*, not one presupposing a law which has been violated, but one which is breathed for the first time by a higher power into the judge's mind at the moment of adjudication. It is, of course, extremely difficult for us to realise a view so far removed from us in point both of time and of association, but it will become more credible when we dwell more at length on the constitution of ancient society, in which every man, living for the greater part of his life under the patriarchal despotism, was practically controlled in all his actions by a regimen not of law, but of caprice.'[1]

In this way Maine sweeps aside, as prematurely introduced, our modern conceptions of 'command,' 'obligation,' and 'sanction,' with which our authorities on Jurisprudence naturally deal. These three conceptions are, indeed, in constant use in our modern practice. But the words are not in the primitive vocabulary, because these generalisations form no part of the general furnishing of the mind of the primitive man. But the root-thoughts are to be traced in the earliest times, as they are now found in the social life of the Kaffir and Zulu tribes, and in the customs of Central Africa recently described by Livingstone, Stanley, and Thomson, for we find in the Shiré, and in the Masai Territory, phases of tribal life which belong to a people who had never seen a white man till these explorers came amongst them, and whose customs had never received the slightest impress of the civilisation established on the other continents, or of the governments settled in the far north and to the south of their own territory. To this extent, the primitive man may be represented by the uncivilised man of to-day. We are here in search of primitive simplicity of *thought*, and we must find it, where civilisation, literature, education, and a civil government—the growth of historic ages—have no place. Not as necessarily do we connect with

[1] Maine, *Ancient Law*, p. 8.

the primitive man the violence, cruelty, and wrong, found in barbarous tribes, as we necessarily disconnect from his life the many advantages of our heritage from long centuries of thought, and prolonged effort after improvement. Nor do we need to grapple with the difficulties in the way of a complete history of our race, consequent on the poverty of historic records, and the disappearance from the community of nations of the great empires of the East. It is enough that the landmarks of history stand before us, and that we hold over, as belonging to intermediate epochs, the problems concerned with the rise and fall of governing 'races.' In order to conduct our present inquiry with success, we must hold to it, that the one object of our search is the *simplicity of primitive thought.* And this may be found by laying aside, thoroughly and with decision, all those accumulated associations which can be shown to have an historic genesis. Every one can experiment, quite independently, within this field of reflection, ascertaining how much belongs to the dominion of the civil life in which he has his part, how much to the Conditions of Intelligence itself. There is a basis within every mind for the rights which we severally claim in our civil relations; this gives its support to the common recognition of 'the Rights of Conscience,' as it is the explanation of the sense of right and wrong within us, sustaining moral life, as the atmosphere sustains physical life. Even without participating in the difficult range of research belonging to 'the history of law,' we can accept the testimony of specialists, judging of the value of their conclusions, in so far as the fountain of law is *within us.* If we seek resolutely for the simplicity of primitive thought, we may go far towards testing what is offered as the fruit of historic research, by seeking only to identify the simpler elements of consciousness, the primary conditions of our own thought. Here the Philosophy of History and the Philosophy of Mind are united. The remote and the near are brought into close relation: we contemplate together historic facts and the ethical standard we are applying. By such a method, we may ascertain what have been the conditions of human progress, as the race has moved onwards, ever within sight of steadily expanding Ideals.

If we are to obtain a general view of the 'history of law,' we must transfer ourselves in thought to a period antecedent to the advent of 'governing races'; we must think of Man's early experience, as he gained acquaintance with the place of his abode; as he learned the value of social relations, and began to reflect as to how his own interests could be harmonised with the interests of others; and as he came to see that recognised authority was required in order that social order might be maintained. These things were not settled for him, but were determined by himself. All historic advance has been dependent on experience, and that upon the lessons which a rational being has been able to gather from his own actions and their consequences, and from the actions of his fellows, whether co-operating for a general result, or developing rivalry for individual gain.

In seeking to assign their relative value to the historic elements of human progress, we may find it at first difficult to harmonise the views advanced by authorities who seem to differ so largely as do Bentham,[1] Austin,[2] and Maine; but the seeming divergence can be understood and appreciated, if only we remark the differences which separate the modern, the ancient, and the primitive aspects of 'Law.' There is a long interval between the more familiar fields of observation, where the principles of codification are studied, and the sources of national enactments, and next, the 'root-thoughts' of primitive man. It is, therefore, easy to understand how Maine should say, that 'it is curious that, the further we penetrate into the primitive history of thought, the further do we find ourselves from a conception of law which at all resembles a compound of the elements which Bentham determined.' On the other hand, it is no less clear that Bentham has full warrant for his analysis of legal thought and procedure, when he makes account of 'command,' 'obligation,' and 'sanction.' Modern conceptions, no doubt, these are; but the 'root-thoughts' of all the three, as of all that is modern, are to be found in man's primitive life; for our modern conceptions are as much a product of our past, as is our jurisprudence. The thoughts and words of to-day had

[1] *Fragment on Government.* [2] *Province of Jurisprudence Determined.*

their rise in the remotest antiquity of our race. Thought moves at all times and in all places under common conditions, though it moves more simply in early ages, as all life's environment is simpler, where the beginnings of experience are found.

When we reverse the line of observation, so as to contemplate the advance of thought from its advent, we see that the history of advance is a history of *thought,* working its way into increasing complexity, both in environment and in its own content. The advance of our race is ever making increasing demands on the observational, analytic, and critical power of Intelligence, just as the growing complexity of civilised life is steadily increasing its demand on Statesmanship, as upon our economists and jurists. As in evolution of organism, so here, the demand develops power.

On this reverse line of observation, when we look from primitive life forward to the complexities of our modern life, we have constant illustration of interaction of thought and effort, continued through ceaseless conflict of rival interests. It has always been by the *clearing of thought* itself, that the battle of thought against authority, of right against might, has been fought. The Intellectual energy of the race has unfolded the common thought as to all interests and duties, providing for the expansion and defence of the former, and, more slowly, for the enlargement of Ideals concerning morality and religion. The progress of the race has not been an 'evolution' from below; it has been a 'development'[1] from within. The common *Intelligence* has throughout been the source of energy. The fight between Plebeian and Patrician in the early period of Roman history is typical of the prolonged contest of men for common rights, and at a more advanced stage, for legal security. The fight of the people has been for an end of fighting. Our race has advanced a long way in the struggle; but it has still a long way to travel. The end has ever seemed immediate and near; but

[1] Mr. Benjamin Kidd uses the title 'Social Evolution,' but he indicates his meaning, by speaking of 'the development which human society is undergoing' (p. 2), pointing out the need for science seeking 'some deep-seated law of social development' (p. 20).

there is much more in man's claim than the thinkers perceive. Hence the *reflective view* of things, the Science which has traced the laws of Nature, the Philosophy which has searched for the laws of thought and being, the Jurisprudence which has inquired into the spirit and basis of civil law, have always done their work at a long distance beyond the victories which the people had achieved. No doubt it is true, that when Science, and Philosophy, and Jurisprudence come on the field, they do much to rule human thought in its further advance; but it is the popular thought which clears the way; it is the more critical and highly developed thought which ascertains exact results, and shows that the Ideal towards which the race is moving, is constantly needing enlarged expression. The victories of past generations have thus shaped the conflicts to be carried through by succeeding generations. We cordially agree with Mr. Kidd in his view of 'social evolution' when he attributes social development to 'deep-seated laws' of the common life, and urges that Science has not done the fighting work by the success of which human progress has been ensured.[1] In searching for the 'root-thoughts' of progress, I am not in any way at variance with his fundamental position; though the form in which I find it needful to place the argument, would lead me to seek a different title for his Chapter headed by the proposition 'Human Evolution is not primarily Intellectual.'[2] I certainly agree with him, when he maintains 'that Darwinian science must eventually establish that the evolution which is slowly proceeding is not primarily intellectual, but religious in character.'[3] Nevertheless, as intellectual and legal progress must go together, so must social progress depend on intellectual. It may be even nearer the truth were we to say, that progress is first in thought, afterwards in action, and finally in achievement. Mr. Kidd is undoubtedly correct in representing that the motive forces and the thoughts go together—the religious and moral impulses, the conceptions, and the efforts, belonging to one epoch; for progress could not be effected if these

[1] Kidd, *Social Evolution*, p. 20, *et passim*.
[2] *Ibid.* p. 243. [3] *Ibid.* p. 245.

were not in combination within the Consciousness of the age. The search for the key of progress may, therefore, be represented either as a search for the 'root-thoughts' of a movement, or for the 'deep-seated laws of social development,' or for the grand persistent motive forces of the race. The philosophic view, concerned with analysis of consciousness, will naturally represent the task under the first; the social reformer, more concerned with national movements, will naturally prefer the second; the historian, concerned with wider generalisations, will have constant regard to the third. But these views are one, inasmuch as there can be no social advance in which the motive forces and the thoughts and the efforts of the people are not in unison. I am here dealing primarily with the growth of Law, but it is typical of the whole, inasmuch as Law becomes the expression of the result when a given stage in the journey is ended. The people who strive after advance naturally seek to defend what has been gained; thus Law becomes in a sense the flower, and then the fruit, of progress. While telling of desired guarantee for conquest, Law is a deliberate attempt to give authoritative value to what has been done, and it is, in its ultimate form, an effort of specialists to give exact expression to a claim duly recognised. It thus appears that Law, which is apt to seem primarily the utterance of a ruling authority, and outwardly has all the semblance of this, becomes in the history of human progress the expression of the thought and desire of the people, stated with such measure of precision as actual achievement renders possible. At the same time, under the conditions involved, it is impossible to claim either for the rulers or for the ruled, that they foresee and deliberately accept the issue; for it is true, in a high and important sense, that 'set purpose had the very smallest share in producing change.'[1] This is a fact which makes human progress most impressive to ourselves, when we come to consider what has been achieved, and specially the manner in which it has been accomplished. When we search for the 'root-thoughts,' we are surprised to find how deeply they have penetrated into the soil; and, at the same time, how little they have given

[1] Maine, *Ancient Law*, p. 21.

premonitions of the growth to follow. It is when the tree is full-grown that we are effectually taught the value of the root-life.

These considerations lend special interest to Maine's analysis of primitive thought in contemplation of the History of Law. A view of the results may be placed within moderate compass, and they will be found of special significance in their bearing on the general argument as to the natural history of the human race. I state the successive positions briefly, but, as far as possible, in the words of the author. 'It is now clearly seen by all trustworthy observers of the primitive condition of mankind that, in the infancy of the race, men could only account for sustained or periodically recurring action by supposing a personal agent. Thus the wind blowing was a person, and, of course, a divine person.' As it was 'in the physical world, so in the moral. When a king decided a dispute by a sentence, 'the judgment was assumed to be the result of direct inspiration.'[1] One of the gods became the agent directing the chief or ruler in his awards. At this stage, men are not concerned with formal laws, but with 'separate, isolated judgments.' 'In the succession of similar cases, awards are likely to follow and resemble each other. Here we have the germ or rudiment of a custom, a conception posterior to that of *Themistes* or judgments.'[2] We are here still without formal reference to Law. '*Νόμος*, a Law, so great and famous a term in the political vocabulary of the later Greek society, does not occur in Homer.'[3] Awards in particular cases are closely 'linked with that persuasion which clung so long and so tenaciously to the human mind, of a divine influence underlying and supporting every relation of life, every social institution.'[4] 'The conception of the Deity dictating an entire code or body of law, as in the case of the Hindu laws of Manu, seems to belong to a range of ideas more recent and more advanced.' At a period of still greater advancement, we find a special class of men concerned with law and judgments, as with religious rites. 'A supernatural presidence is supposed to consecrate and keep together all the cardinal institutions

[1] Maine, *Ancient Law*, p. 4. [2] *Ibid.* p. 5. [3] *Ibid.* p. 5. [4] *Ibid.* p. 6.

of those times, the State, the Race, and the Family. Men, grouped together in the different relations which those institutions imply, are bound to celebrate periodically common rites.' In course of time, a group of councillors gathered around the ruler of the people. 'A historical era of aristocracies succeeded a historical era of heroic kings.' 'These aristocracies were universally the depositaries and administrators of law.'[1] This brings in 'the epoch of Customary Law.' The accredited administrators of the law 'do not appear to have pretended to direct inspiration for each sentence.' 'What the juristical oligarchy now claims is to monopolise the *knowledge* of the laws, to have the exclusive possession of the principles by which quarrels are decided.' 'Before the invention of writing, and during the infancy of the art, an aristocracy invested with judicial privileges formed the only expedient by which accurate preservation of the customs of the race or tribe could be at all approximated to.'[2] At length we reach the age of codification of recognised laws. We are within 'the era of Codes.' Quite enough, too, remains of these collections, both in the East and in the West, to show that they mingled up religious, civil, and moral ordinances, without any regard to differences in their essential character; and 'this is consistent with all we know of early thought from other sources, the severance of law from morality, and of religion from law, belonging very distinctly to the later stages of mental progress.'[3]

Such in bare outline is a view of the results of Maine's researches; and these conclusions are sustained by the testimony of history, gathered from all quarters. When it is remarked how closely religion, morality, and law have been mixed up in primitive thought, it will be seen that the 'root-thoughts' of our race are now embodied in the organised system of law which is a common characteristic of our modern civilisation under all varieties of national life. I concentrate here on the root-thoughts, rather than on the mind-forces, for this obvious reason, that the life-forces never show their potentiality till the thought, moving in company with them, finds some application in united action. These

[1] Maine, *Ancient Law*, p. 11. [2] *Ibid.* p. 12. [3] *Ibid.* p. 16.

Life-Forces are moving within the individual consciousness, when a man keeps thinking of his own lot, or is muttering, in broken vocables, about his wrongs; but it is when common instincts and desires find expression in language which rouses sentiment and directs action, that the fountains of life give forth their streams with a force influential for progress. Beyond inward feeling, so much depends on its communication stirring sympathetic response, that it is seen to be essential to the early efforts of men to give expression to their feelings and desires in the midst of social life. To live in society, however primitive its organisation, is to realise the need for putting the motive forces of our life into working form, making a definite impression on social life for realisation of improvement which must, in some measure, promise a common good.

Community of interest led to the first germs of civil government; but it was the rivalries and disputes of men which made it needful to have the award of a recognised authority. The root-thoughts are discovered when we see how men have stated their claims, have advocated human rights, and have at length found some formal declaration, be it award, custom, or law, standing to them as a security for what men continue to claim while life lasts. It is nevertheless natural, from the conditions of social progress, that, even when some gain is being secured, the members of a community, small or great, should feel that Law is a phase of dominion,—a limitation of the freedom so dear to the soul of man. Even when appeal to authority is inevitable, there must be a disposition to regard the ruler, or even legal authority itself, as something of a despotic power, to be resisted. This accompaniment is inevitable, because the self-regarding disposition is ever present. Appeal to Law for redress of wrongs will always be easier and more agreeable, than abiding by an award which involves condemnation and penalty. Yet the one phase of feeling must have been as common as the other in primitive society, as well as in mediæval and in modern times. Only as the reward of development of individual thought, and the consequent expansion of civil privileges, can the members of a tribe

become a law-abiding people. But when advantages are steadily extended, Law becomes the guardian of common rights, and it comes to be so regarded by the subjects. Accordingly, Maine indicates a natural result of the development of society, when, referring to early codes of laws, he says that one of the chief advantages 'conferred on the societies which obtained them, was the protection which they afforded against the frauds of the privileged oligarchy, and also against the spontaneous depravation and debasement of the national institutions.'[1]

Along this line of research, we are enabled to trace the vital forces of human life, and the root-thoughts living in the most primitive forms of social organisation. Evidence shows that primitive man had regard to individual rights and duties; that he looked to authority as a needful expression and defence of personal claims; and that he believed in a divine supervision, which filled Nature as a whole and touched it at every point, and which watched over human life very specially, even guiding judicial awards of men. These are the root-thoughts of the human mind, present in remotest times, preparing for gradual appearance of Law, providing for development of Social Order and security. The vital forces, stirring from the first, and continuing to propel social life throughout all its history, are self-interest, regard to fair play, and religious sentiment. These commingle in all ordinary experience, while some one of the three becomes ascendant at times. We cannot read the history of our race; we cannot turn to the social life of the uncivilised tribes of our own day, without discovering the root-thoughts and the vital forces blending in their action, steadying the social fabric, and directing movements towards an experience at once more agreeable and more promising.

These vital forces, commingling from childhood, issue from the individual life, as the waters from the spring. An overflowing store must have outlet. But energy such as this is too exclusively of the nature of force, too little of the nature of reflection, to secure the outcome we find in history. The root-thoughts are the true sources of social advance. The

[1] Maine, *Ancient Law*, p. 18.

life-forces depend for their efficiency in a rational life on the exercise of a higher power, which can guide them, and direct towards an issue in which all may have common interest. Thoughts as to self-interest, reference to that which is equal between man and man, sense of divine authority and control, vitally united in the activity of a life passing through the discipline of struggle, together give direction to the life-force, so as to secure, in gradually increasing measure, the common good which men seek after.

On evidence now before us, it is clear that Ethical and Religious Conceptions were combined in primitive times. The same ethical conceptions, however enlarged their application, have currency and acceptance with us now, supplying an important witness for the unity of the race, and also constituting a standard of measurement by which we may judge of progress achieved in human history. Along with the ethical thought of early times, we have to note not only the presence, but the prominence, of Religious Ideas. The significance of this will be considered presently. In the first instance, however, attention must be directed on the regard to right and wrong, giving promise of a new order of things in Nature, and stability for that order when organised, preparing the way through course of ages, for the system of Law, and for growth of a law-abiding spirit within organised communities.

The conspicuous phases of primitive life show that regard to self-interest, and the social instinct developed in family life, had united with them thoughts as to order and rule. In a way possible only to a Reflective Nature, and in contrast with animal impulse, the force of self-interest proved in some sense a check on itself, limiting outbreaks of violence, and restraining spread of wrong. There was a regard to fair play, if not dominant, ever recurring and persistent; there was a view of personal rights, however restricted in range; and on each individual of the tribe there rested some sense of responsibility for his doings. The understood rights of the tribesmen implied some measure of free action for the individual, under rule of the acknowledged chief, the defence of conjugal and family rights, and

of rights of property, a settlement of disputes by the chief, balancing the claims of disputants, and giving an award which might be taken as expressing the will of the Deity, the Supreme Power, or of the gods with whom supreme power dwelt.

These fundamental thoughts of ethical life, as they found expression, became more clearly defined in the tribe to which the man and his family belonged. These rules of conduct played their part as essential conditions, without which social instinct itself would have been little more than gregariousness among animals, an instinct of companionship, without organisation, and with no abatement of rivalries, save by appeals to brute force, the ultimate arbiter among the animals. The distinctive features of Rational Life were thus with man from the first. These consisted mainly in thoughts which had to work their way through inward struggle, where animal passion, self-assertion, and persistent instincts had to be checked and brought under rule; and next in a social life where rivalries and jealousies were in active force, in consequence of which manifold and grievous wrongs were not infrequent. Through such conflicts as these, each man had to fight for his place, sustained by some rough form of justice, notwithstanding reappearance of injustice in endless varieties. Through such conflict and disadvantages, men and women had to seek, as the essential conditions of their intelligence urged them, such self-control, such fairness in their dealing with others,—in a word, such development of moral character,—as only a rational agent can attempt, but which every rational agent must strive after, if he is to find in social life what he seeks, the satisfaction which all the motive forces of his being, and all his thoughts, turning over and over actions and consequences, induce him to seek.

Under conditions thus briefly described, the motive forces of a Rational Life had to work, guided in some measure by intelligent rule, though such rule was liable to be obscured, —sometimes even lost to view,—under tumults of passion, often fanned by social influences, instead of being quenched by them. But the vision, lost for a time, surely came back again in quieter times and places, as the memories of youth

return to consciousness. The government of tribes developed in some cases with more success; in other cases it was delayed, and even subjected to temporary reverses. The early stages of advance appeared, within limited areas, in the midst of small communities. As efforts extended, there appeared the conflicts of neighbouring interests; the forceful intervention of ruling races, ambitious, stirred by lust of dominion. Through these long ages of conflict behind us, the tidal wave seemed often receding; but it was surely followed by the spring tide. At length the annals of progress became crowded with records of grand achievements. Through every part of the protracted history, and in every phase of its unfolding, thoughts came to the front with more of clearness and force, finding ever deeper meaning by wider application. At stages when a threatening crisis seemed at hand, men fitted for leadership appeared, under whose guidance the longings of the people found voice and direction, pressing into view an ideal for which the men, striving in a great enthusiasm, found themselves only partially prepared.

In tracing these characteristics of primitive life, as they contribute towards a theory of man's place in Nature, we must note how Ethics and Religion are mingled. Our single object in dealing with evidence before us is to be assured of historic accuracy—to be satisfied that the facts were as they are here represented. But the value of our study is in no way involved in the accuracy of the Religious Conceptions of primitive man; nor is our argument as to the conditions of human progress in the least affected by modern scientific discoveries as to the reign of fixed law. At this point, we have no concern with the characteristics of modern thought. To judge primitive thought by the standard of a scientific age were anachronism; a species of unfairness which must be a reproach to us, did we even cursorily indulge it; a weak enjoyment in exercise of a superior judgment, because the criticism is so easy. Our task is to detect and interpret the forces at work in the early stages of social life, when the conditions of life were the simplest, and when thought had to do its work tentatively, by way of experiment, without aid of accepted forms and

established institutions. The true pleasure of such study is to see how much the rational life is equal to, even in its primitive simplicity. In view of this, it is a worthless suggestion to say that primitive man should have thought more accurately than he did; for that is all the same as to insist that primitive man should not have been so simple and untutored as he was.

If our first aim is to secure accurate statement of the facts, our next is to interpret them in the true historic spirit, with all the advantages which modern research can give, whether it appear in historic discipline or in scientific knowledge. Granting the inaccuracy of primitive religious conceptions, because of the absence of scientific knowledge, these conceptions must be all the more surprising to us, and must have a deeper significance, contributing much more towards an interpretation of primitive thought than at first appears. In some respects they surprise us even more than the discoveries of a scientific age, because men were then working under enormous disadvantages.

Utilising all our gains from recent criticism, we have to place before us for deliberate consideration as a single representation of primitive thought, 'that persuasion which clung so long and so tenaciously to the human mind of divine influence underlying and supporting every relation of life.' It is an amplification of the thought-process involved, when it is said as to the primitive view of occurrences in Nature, that 'in the infancy of the race, men could only account for sustained or periodically recurring action by supposing a personal agent. Thus the wind blowing was a person, and of course a divine person; the sun rising, culminating, and setting was a person, and a divine person; the earth yielding her increase was a person and divine.' Whence comes this continual reference to divine influence? How are we to account for it as characteristic of primitive man, and for this additional fact that it 'clung so long and so tenaciously to the human mind'? There is but one answer. It is characteristic of Rational Power, which not only has continual regard to cause and effect, but which cannot think of Nature's processes without thinking of a causality higher than itself,

possessed of Intelligence and Will such as ours, but transcendently great and supreme. To think in such a mode as this, dealing with an invisible power, source of all events in Nature, is to prepare for ceaseless questioning and speculation, which the instinct of man induces him to follow out. Primitive man opened the way; later ages tenaciously held on this line of advance till a scientific age, far down the stream of time, opened out a wider range of vision, disclosing the dominion of fixed law, and uniformity of sequence in Nature. Now, human thought is wider in range, clearer in its possession of knowledge, and more fully assured of accuracy in its interpretation of Nature's methods. The age thus equipped has to account for primitive man thinking as he did; and for such thought proving habitual through succeeding ages; and being replaced by scientific thought as to fixed law, and as to evolution of life. We believe in intellectual development through the ages; we believe that later ages yield the fruit of antecedent periods of growth. How are we, then, to account for primitive man's thoughts of the Divine? Uninstructed he was, very limited in the range of his knowledge, and consequently in many respects inaccurate in the structure of his theories. Nevertheless his thoughts were of the Divine; and so directly did he pass from Nature to the Supernatural, that he saw in all Nature's procedure, occasion for tracing the action of a Transcendent Being. It was still the same, when he thought of the social relations with which our best interests are connected, even if it proved true that from his social relations also came many of the dangers of life, and of the wrongs he endured. Through the conflicting lines of thought here involved, he still passed on to God, and saw in His influence man's best security for Equity, if not for equality. Our modern scientific thought at times grows impatient, and inclines to make light of primitive thought, in part because it is so religious. At times, we have even contemptuous reference to the 'childhood of the race'; but the Evolution theory with 'Roman severity' condemns this as unscientific, bidding us remember that all life must be interpreted by reference to its primitive forms. At other times, the scientific thought of the day has become boastful of its

achievements, speaking even of having 'driven back the Supernatural,' and prophesying of additional achievements to come. But Science does no more than correct the errors of an unscientific age, giving a more accurate reading of natural processes. The question as to the divine action is unaffected by the discoveries of science, as it was by the errors of primitive man, except that, in completing our conceptions of Nature, Science has intensified the demand upon the Supernatural, making it more manifestly an intellectual necessity to think of God as immanent in Nature.

Our immediate purpose, however, is to secure more accurate views of Nature, and specially of the natural history of Life on the earth,—more directly of Man's place in Nature. When, in this relation, we contemplate religious thought as among the root-thoughts of human intelligence, this fact, conspicuous in history, must be taken as adverse to the theory of Evolution. If such thought had been the outcome of long ages of reflection; if it had been the product of the world's education; if it had been the fruit of the enlargement of ideas which modern science has brought to our race, there might have been plausible support for a theory of the evolution of thought concerning the Infinite. But when we trace such thought back to the primitive life of man, finding it to be even the governing thought of man in that remote period, the hypothesis of the evolution of Rational Life from Animal Intelligence has the testimony of history against it. The evidence that primitive man exercised, expressed, and cherished thought concerning an Intelligent Power above Nature, completely overturns the suggestion that he occupied his intelligence only with animal wants, showing himself akin to the higher mammals. The fact that, while living under constant pressure of animal wants, he largely exercised his thought as to Divine agency, demonstrates that a rational life has within it a potentiality of which organic evolution carries no trace of preparation. Human thought proceeds more by reference to the law of causality, than by reference to nerve-sensibility. It takes sensory experience as fleeting, but as witnessing for much more than the changes of transitory feeling; it seeks a potency everywhere for all

that is occurring; and, finding it in part in Forces near at hand, with which it comes into direct contact, it sees the ultimate cause in a Transcendent Power controlling all events, and seeking above all, that Justice may be done on the earth. Therefore, men have from the first believed, that the chief, or ruler of the tribe, should in all his awards be the exponent of divine justice. The root of our religious conceptions is thus in our own nature. We cannot exercise our powers of thought, without thinking of the Cause of all superhuman occurrences.

CHAPTER XIV

HUMAN LIFE

DISTINCTIVE FEATURES IN ITS DEVELOPMENT

Modern Thought

THE task of modern thought has been to differentiate and separate, in order to provide for further progress. Things could not continue in the simplicity of primitive times; could not be judged by the conceptions of earlier ages. A Rational Life, moving through the centuries, has carried forward increasing evidence of advance. Times primitive, ancient, and mediæval have made their contributions to human progress. The results are accumulated in complex form, and a scientific age finds before it the double task of criticism and research,—History supplying the one field, Nature the other. For research into the latter, the age has at command instruments never handled before. By use of improved apparatus, Nature's secrets, hidden through long epochs, concealed from the view of the most instructed, hidden from the imagination of the most gifted, have been at length disclosed. Marvels of discovery have rewarded modern research; these have come upon the race with the quickening power of sudden and large increase of knowledge; and yet they have come to impress the mind with the complexity of Nature's method, leaving all around us a multitude of unpenetrated secrets. A new training for the race, provides at once for the enthusiasm of enlarged ideas, and for the reverence and faith coming from sense of vastly extended regions, within which are buried untold treasures. Not readily will man show himself equal to the task of unlocking these stores. Nevertheless, the past gives much to celebrate, as we enumerate the

achievements of science; and it also inspires large hope, even if accession of discoveries do not come so fast as when the microscope first gave to man extended range of vision. In the beginnings of a scientific age, with its sudden enlargement of knowledge, it was as when the light of day comes to meet the moonlight shining at its brightest; as we grow familiar with the brilliance, we have to learn anew, that while even clearest light does not give the object of our search, it provides for fresh and more persevering use of powers of observation.

To toil, and to gather a season's harvest, has been the ordinary task of men in all ages; but the task of knowing Nature has proved to be a special one, to be committed to men who have passed through a discipline of training. It remains the common privilege of men to look on the face of Nature, finding thence education and inspiration through the avenues of sense, as these carry to us ever varying lessons. To specialists has fallen the heavy share of the work to be fulfilled by toiling, out of view of their fellows, searching for Nature's secrets, bringing back at intervals their discoveries, more or less extended. What the results have been has to some extent been shown in course of preceding discussions. In so far as these belong to biological science, they tell of steadily increasing complexity of brain structure, with extending ramifications of nerve system, sensory and motor. These investigations, however, lay open only a small part of the field of research. Division of labour, the conspicuous feature of modern industry, has proved equally characteristic of Science. And this division has now been carried so far, that groups of specialists are unable even to judge of the work of other groups. The further demand of our day is the unification of results, the discovery of the *system* of things so far as that has been deciphered, the synthesis of newly acquired knowledge. In the midst of such endless variety, there must be serious difficulty in attaining an instructed view of the unity of Nature. Short of this, however, each fresh line of discovery has been making its own impression on the thought of our age. Having regard to the latest results of biological science, which have

specially engaged attention here, there seems to be within reach a definite conclusion as to Man's place in Nature. This may be the more important, as it brings before us the main problem of existence, by which our judgment must be guided in seeking to understand the system of Nature as a whole.

There is a vivid contrast placed before us, as we compare the primitive thought of man with the thought of the present day. 'In the infancy of the race, men could only account for sustained or periodically recurring action, by supposing a personal agent.' In our times, we see everywhere the reign of fixed law, and we begin in some measure to realise that all Nature, down through long past ages, has been moving on a line of advance, slowly working out a system of such complexity, as to baffle the penetration of hosts of specialists. We begin to see, and so far to appreciate, the interaction of cosmic law, operating through environment on all the life in the world, working up towards a growing complexity of structure, with steadily increasing powers of effort, until Man, gifted with Reason, came on the field, to begin his particular task. This contrast between fixed law and rational agency stands before us, with striking vividness, as if companion pictures hung before our eyes on the wall.

Consider the history of progress, which has given the subject for the later picture, and it will appear how largely the world's advance tells of the persistence and triumph of human thought. This presents a remarkable illustration of the *turning back* of Rational Power on materials of observation in order to interpret them. Clifford's words return to us, as having singular appropriateness :—'It follows that our ancestors have made the world to be what it is for us—that is to say, what it is to all those who have studied Nature, whether as scientific men or as artists. They have felt that out of the things that they studied, something like a similar intelligence was looking at them.' The representation of Nature, now possible to us, is one which shows that all movement on the earth has been incessantly selective and purposive, bringing forth results which have demonstrated that Nature, working by differentiation and separation, has worked towards unification of the Cosmos.

But, as we celebrate the achievements of modern thought, recognising the wonderful advance effected, it is needful to remark how much of this large gain depends upon *observation*, on persistent, patient, intelligent *looking* at things, with the increased power of vision which the microscope has given. Lift the microscope out of the modern period, and the great majority of our gains are lost; humanity relapses into the comparative ignorance, characteristic of an earlier period; so little has thought done by its own inherent force or originality, and so much has it achieved by a new instrument placed at its command. It seems as if we should give large praise to the inventor and skilled artificers, honouring them more than we have hitherto done, not overlooking an old philosopher who made his daily bread by polishing lenses, and thereafter retired to his attic to think how true it appeared 'that all things are in God.' On the other hand, how *little* is the microscope without the observer, and how far do men, even specialists, miss the lessons lying nigh at hand, if they be not also thinkers, seeing an intelligence looking at them through the array of facts.

One thing is being pressed into notice, which must be deliberately pondered: *the advance in modern thought does not imply an equivalent advance in thought-power.* The most able thinkers of our day do not dream of maintaining that an increase of Intellectual Power is the key to modern progress. Is it not their uniform testimony that their successes have been achieved, not by pre-eminent intellectual ability, but by patient continuance in observation and interpretation of the facts observed? While admiring in them a modesty maintained with transparent integrity, we do not forget the praise due to the men who have worked out the splendid results gathered in a scientific age. But it is of consequence to note that, in the history of human advance, there has been no such enlargement of thinking-power as there has been advance in knowledge. Our ancestors, antecedent to a scientific age, had as good thinking-power as we possess. The annals of literature of earlier date are studded thick with names, which we could not propose to surpass by any array of our nineteenth century authors. Even were

the capitals of Europe allowed to gather into a single representative body all the ablest men of our times, we could not claim to have excelled the masters of Greek thought. It is in the light of these common features in human history that we must define our meaning when speaking of the advance of modern thought. However varied in degree human intelligence may appear to be, the thought-power of a scientific age cannot claim to have transcended the intellectual vigour of the ancient philosophy, or of the illumination which broke over the race in the revival of letters. Modern thought has at command a wealth of knowledge, and is rich in ideas, not on account of a steady accession of original talent, but because of the opening up of a new territory of existence; because we have been permitted to see what in earlier times was hermetically sealed beneath a surface which had never been broken up by investigators. The explanation of hid treasure having been discovered so late in time, and by efforts so laborious, is this, that Nature advances by first enfolding what must again be unfolded, in order to be known, while more than power of human vision was required to see the minuteness of complex structure essential to every example of living organism.

Thus we make more clear to ourselves what is implied in the advance of modern thought which we celebrate. It is an advance in the content of our thought, and in the outward conditions on which we think, consequent on deeper knowledge of the laws of Nature, and of the modes in which her ends are gained. In the sphere of *agency*, much is due to our own ancestors. We owe much to our position, simply because it is late in time; we have the heritage of the ages; we are continually reminded of it by our indebtedness to the treasures of Literature. 'Our ancestors have made the world to be what it is for us.' In the sphere of *result*, our gain is in accumulated knowledge, in provision of accumulated impulse, but not in accumulation of thought-power. Even with this limitation, however, there is an immense gain to our race in entering on the possessions—even the early possessions—of a Scientific Age.

That the large increase of knowledge is an education to

the race is now a commonplace with us. But there is need for considering more fully what this education involves, and specially what are its conditions. The general acceptance of the theory of Evolution of Organic Life has made this a necessity for our day. The significance of the general education consequent on the advance of science, is first made apparent by what has just been said as to the work of specialists in fields not open to common observation, but quite out of view of the people. The modern situation is in striking contrast with that of primitive man, looking out on Nature's procedure only as the child does, with eyes and ears open to Nature's education. In an age of specialists, Nature's deeper lessons, hidden all through the ages, are deciphered and read by only a few. By them fresh discoveries are received with enthusiasm; and the results are reported to the public, as news are distributed concerning exploration in Central Africa, or in the Arctic regions, without its being possible for the public generally to understand the specialties of observation required for verifying reported results. Specialists subject anew to test what has been affirmed, and only when a consensus of opinion is obtained among experts themselves, is the public mind satisfied that a new truth has come within sight of the common intelligence, as a new star comes within range of the telescope. It is this mere *receptiveness* of the public mind, even of the 'educated mind' of our day, which prevents the advance of knowledge from being regarded as implying proportional *progression* of human intellect. There is a relative advance, but the wide separation between knowledge and faculty remains conspicuous in our day. In so far as it has been imagined that the advance of knowledge and the advance of intellectual power are one, there is a fallacy in circulation which needs to be arrested and banished. There is no such equivalence; but there comes at length, at a remote distance, a general educational result, more slowly attained; for only a modicum of truth becomes a permanent intellectual acquisition incorporated in the life of the race. When this is noted, it is obvious that the analogies of Organic Evolution are falling away, and

losing their value, as we observe and interpret the conditions of human progress. 'Descent with modification' is dislodged and relegated to its place as concerned only with organic life. Slight modifications of structure, appearance of new functions, and 'origin of species,' are here things remote, as the fauna of a distant land, a thousand miles away. We may visit the region oftentimes, and we shall still find the fauna as we had observed it before, for the conditions of life there continue as they were. But the education of the human race belongs to a region far removed, where the conditions of life are altogether different. To refer to 'the unity of being,' as if its admission were a hindrance to full acknowledgment of what is here stated, is wide of the mark. The earth is one, though its continents are different.

Closer scrutiny, however, of the current education of our race by advance of science is needful here, that we may duly appreciate the advance of thought in our age. As the scientific advance is not due to the movement of the thought of the whole race, the actual gain is not at once an accession to the life of the entire race. Movement and modification are not linked together here, as Darwin saw them united in his observations of animal life; education means so much more than modification of structure, achieved by interaction of cells. We need only think of the conditions of education, to see how vast this difference is. There is, indeed, an Intellectual 'Evolution' here, and we may well keep the word; but it has a different meaning now, and has no natural or theoretic relation with that of our usage when speaking of evolution of species. It is no longer organic evolution, but evolution of thought in the history of a rational life, more slow in movement, but greater far,—an unfolding of the secrets of Nature is followed up by an unfolding of the conditions of Thought, in accordance with accessions to our knowledge.

We must return to *the primitive aspects* of thought, in order to view aright the education of our race. We must see how the *active* and the *passive* combine, providing for the slow educational advance. Nothing enters mind for

educative effect, except by the gateways of knowledge. That which remains unknown has no efficiency in the movements of intelligent life; and that which does not move, does not impress. We are here reading again, under altered conditions, the lessons previously taught us by evolution of species, learning once more, and with deepened interest, how slow and measured are the steps of Nature's advance. Here we are observing the progress of human life itself, under action of Nature's laws,—only that which enters by the gateways of knowledge does its work in educating. There is, however, an assured result, according to the value of that which gains entrance. There may, indeed, be something disheartening in the slow travelling of knowledge over the world; but all, at length, have some share in the harvest. If only there be seed supply, it will be seen, even on moors and mountains, that every little stretch of free soil has a patch of growing corn. When light and heat come to the world with dawn of day, they come to all, even though it remain true that the corn does not ripen equally in all places.

The common law of Intellectual Progress is clear,—all knowledge educates. We may, indeed, have to guard our statement of the law by indicating that we speak of the knowledge of Nature's secrets. Crossing the boundary line between knowledge of Nature and knowledge of human conduct,—knowledge of the natural and knowledge of the ethical,—we include knowledge of evil, with baneful education in wrongdoing. Science is a stranger in this sphere, only too familiar to men in their journey through life. Here we trace perils which never reach the animal kingdom. It is in human experience that the powers of evil become known, ever causing additional friction to the wheels of progress. We drive over heavy roads. Still, the way is not blocked against us. Even in face of all obstacles and hindrances, advance is sure. Our race is slowly moving forwards. Whatever of knowledge enters the mind, whether it be simply true to fact, or both true and wise, comes to educate. There is enlargement of mind, as there is expansion of knowledge. The contrast between moral good and evil being recognised as a perplexity to be afterwards

considered, we must stay to note that there are large differences in the impress which knowledge makes on life, on account of differences in the nature of the knowledge, laboriously gathered and laboriously received. There is a difference between stones and bread, though both are produced by processes of Nature; and so is there a difference in efficiency between a knowledge which only instructs, and a knowledge which educates in the larger sense, as it strengthens the life. For a long period we have been engaged building the bridges which are to bring nearer to each other the far parted tribes and nations of men, and not without special knowledge could this work be effected. Something of education goes on through the rough work of railroad-making and ship-building, and throughout the later business of ploughing along on the journeys of life over mountains and through the waters of distant oceans. But education in its larger sense comes after all this, following upon the advantages thereby secured. Much more time must be allowed for this later and greater work. Not a little is assigned to individual effort when we recognise that knowledge is the condition of education. Besides, we must grant that much by way of preliminary and preparatory work is required of us, in order that true breadth of education may be secured. Knowledge of *language* is only as a bridge crossing a chasm, in order to connect territory otherwise separated, and opening up new avenues to the portals, at which treasures borne onwards are not merely to be laid down, but to be distributed, and specially to be used by those who have understanding of their value. So must we own, by way of further contrast, that in these days of rapid advance, there is a knowledge which seems to fall into abeyance, being completely surpassed by later acquisitions,—forgotten as a thing out of date, as much a thing of the past, as the advertisement of an antiquated machine. It is *new* knowledge which wields a conspicuous influence in our times; powerful, not merely because of its novelty, but because of the greater insight into Nature it secures, and because thereby our life is brought into closer contact with the order of things to which we belong.

When account has thus been made of the wonderful accession of knowledge gained in a scientific age, we have next to consider how far the *old knowledge*, possessed by all the ages, seen even by primitive man, has continued to influence humanity in the history of its advance. Here it will be found that a measure of novelty is added to our representations of this old knowledge, by the new relation in which it appears, consequent on the vast accession of discovery, of which we boast as the *exclusive* possession of recent times. It is manifest that the old knowledge is essential to the life of man, spreading light directly on the path every man travels, illuminating the soul as to personal duty and interest, and, by reason of its practical value, giving a strength to life which has scattered over the pages of history deeds of heroic endurance and daring. It was this old knowledge which primitive man possessed and applied in the simplest phases of social life, when distinguishing right actions, appealing against wrong, and pressing his personal claims, even while 'the only *authoritative* statement of right and wrong was a judicial sentence after the facts.' It was this old knowledge which fixed upon it the attention of Socrates, when philosophy was in danger of being denounced as a failure, and the renowned Greek essayed a fresh start, saying to the man of Athens, 'Know Thyself'; pointing his hearers to that knowledge of general conceptions which ruled in the public assembly when men reasoned of justice and civil right. This is the knowledge which in later times came to be spoken of as 'light of Reason'; in possession of which men of modern times have appealed to Conscience as a sovereign power within consciousness, and on account of which men have claimed to move within a charmed circle, sustained by 'conscientious convictions.' It is this knowledge which is recognised as *a common possession*, when modern schools of thought have debated whether its presence within man can be accounted for by his subjection to two great masters, pleasure and pain; or rather by this, that a rational life possesses by its constitution true insight into the conditions of sound thought and of right action. It is this knowledge which plain men appeal to in the

business of daily life, untroubled by abstract discussions, feeling that there should not be any more dispute about it, than there should be as to the trustworthiness of their eyes and ears.

If this old and familiar knowledge of right and wrong is as potent in our day as in past ages; if it supplies as clear a basis for the system of Law in the midst of modern civilisation, as it did for simple discussions as to personal rights in primitive times, this is because it is a knowledge in its nature and application essential to the regulation of the Life, and therefore it must have had a large degree of efficiency throughout the earlier progress effected in the history of the race. In this knowledge, as associated with the vital forces within, we must find a great part of the explanation of advance, when we study human action in its relation to environment, natural and social. At first sight, indeed, it would seem as if there were a serious difficulty in admitting that such power can have been possessed by a knowledge thus common. The force of this difficulty may be best represented in the following form: this knowledge, simply because it has been common to all the ages, is inadequate to account for an advance steadily extending from primitive times till now. The objection, as thus put, seems to have much force. But this semblance of force arises from failure to estimate truly the conditions of rational advance. That such advance has taken place, no one disputes; and just as little can it be contested that the distinctions between right and wrong have been vital to the discussions, in whatever age, as to individual progress and social improvement. Moral thought and moral claims have preceded the more elaborate organisation of society, and the extension of personal freedom, which are the consequences of human progress. These distinctions have been influential in human history long ages before men came to recognise the laws of wealth; have swayed private and public life, when science was a thing unknown, and when human sensibilities and preferences decided all that is now being arranged by reference to laws of sanitation. Thus we are driven back for explanation of human progress on the primitive conditions of thought itself,

recognised in the simplest application of rules of conduct, equally authoritative for Chief and tribesmen.

But besides this, and more especially, because effectively turning aside the objection, moral conceptions have grown in *amplitude of significance* in the history of our race, as they have found wider application in face of growing complexity of social life. The Moral Ideal, which was seen only in simplest form in primitive times, has enlarged in its proportions, and in the range of its demands, with every stage in the history of advance, and has thus effected a deeper hold on the moral and religious sentiments of our race, so directing these as to give them new power in thought and action. To overlook this expansion of moral ideals would be to omit one of the most marked characteristics of rational life. To include it, and to assign to it its true historic value, is completely to remove the difficulty connected with the appeal to *common* thought as the grand factor in human progress.

The expansiveness of moral ideals; the discovery of the deeper meaning of the primitive thought of man; the newness of impulse given to moral and religious sentiments by the more expanded conception of duty and interest reached at successive stages, when taken together, represent the motive forces in social progress. The contrast between the knowledge of right and wrong, and the scientific knowledge which has given a new cast to the thought of modern times, is great. The more common knowledge belongs to the Life, and has its application directly in the government of human conduct. Scientific knowledge in the main concerns what is external to the observer; it is brought to view by searching into Nature, for discovery of its secret processes. The one belongs to the essence of rational life, being vital to its guidance, having had application more or less distinctively from primitive times. The other emerges from a series of brilliant discoveries, never reckoned among the possessions of men, until the fruits of a scientific age began to be gathered. The pathway of intellectual progress has been from the simplicity of the one, knowledge, onwards through growing complexity, to the attainment of the other. Hardly

a single bend on the great highway has a mist-cloud hanging over it.

The key to human progress thus lies quite to our hand. It is found in the forces of human life, animal and rational combined, as these are placed in subjection to a Rational Intelligence, working with ever expanding conceptions of right and wrong. At every stage, the history of human progress has been determined by application of Intelligence in the regulation of individual conduct and of social procedure, by reference to right and wrong, and to the consequent rights of the moral agent. The conditions of advance have been the same in every age, but with a steadily widening range of ideas, as history has unfolded. In the early periods, progress of thought was slow. As social organisation emerged from primitive simplicity, increasing diversity of interests intertwined through growing complexity in the social order. Through later stages, with vision of fixed law, escape was effected from primitive conceptions as to a personal agency in the movements of Nature, from which there came rectification of religious thought, and, with this, proportionate enlargement of religious sentiment. At such times, it is easy for the men of the day to be engrossed with the reversal of old ideas; but the really forceful and prophetic thing is within the movement which is bearing the race as a whole to expanded knowledge, with enlarged ideals. The history of this long extended movement shows Intelligence clearing itself from the idolatries of Eastern civilisation, and still later from the systematised mythologies of Greece and Rome, until the race received large accession of ideas and of motive force, from the advent of Christianity. Later still, we reach the mediæval period of slower movement and repression of natural forces, when religious thought and sentiment, waiting on the lessons of a long and bitter experience, sustained the dominion of religious authority in its claim to regulate life, even to the repression of individuality. Within this period the dominant force entrenched itself behind all possible ramparts. At length came the dawn of the Modern Period—the slow but sure movement of a new life, which could not be checked by antiquated ecclesiastical barriers, for the move-

ment was in itself a reaction against ecclesiastical dominion. In the heart of this movement was the claim for freedom of thought and action; and within that, a true religious sentiment, which, in transcending the past, did not break from it, but grew out of it. This, in slightest outline, places before us the framework of the history of human progress./

We are not here concerned with the details which must engage the life-study of the historian. The obvious and important features are the essential conditions of the movement. From the first, and ever afterwards, progress is the outcome of a Thought-movement, according to its own essential conditions, applying the general conceptions of right and wrong. The outward and visible has its interpretation only by reference to an inner movement, which the agents themselves do not specially reflect upon, and certainly do not critically examine. It is within this invisible sphere that there is constantly being realised a steady expansion of the conceptions with which primitive man made a beginning. These conceptions, by ever-widening application, afforded to them along with simultaneous expansion of knowledge, have ruled the motive forces, animal and rational, struggling for ascendency. It is Thought-movement which is in the heart of the larger movement, visible in outward forms, as expressed in the history of the nations.

To understand the laws of progress, we must keep closely to the conditions essential to all times. Only thus can we escape the perplexities of social organisation, ever becoming increasingly complex in industrial, legal, and political requirements. All thought is at first individual; more slowly its advance becomes general; only after lapse of long time, does it become common. Thinking by general conceptions can be done nowhere else save in the Individual Consciousness. That social organisation determines individual life is only a half-truth, upholding a popular fallacy which threatens to break in upon the integrity of our life efforts. If some authorities have insisted that civil organisation and national institutions frame national thought, we must the more insist that this truth—and truth it is—is only partial truth. The *upheavals* in national history must have their place assigned

to them. All reformations effected by popular enthusiasm, even when victory has been attended by more violent passion, have had their own phases of efficiency, many of them leaving a deep historic impress on the race. Our modern thought could not now have been what it is, but for these upheavals, even though we may argue with some warrant that the general thought would ultimately have reached something like the same result by quieter and still slower methods. That the laws of rational progress are identical, and strictly continuous in application, is the truth to be received as essential. But Thought is individual, and only more slowly becomes national. The nation, whatever it is as a force in the community of nations, is not a thinking machine. It is an *organisation* of intelligent beings according to the prevailing thought of the times. How much in the history of thought lies behind all this! The quiet thinking of individuals; the conflict of opinion in the clash of interests; and the struggle of contending factions, with counter victories and defeats, each in turn beaten back and punished for selfishness and extravagance! The action of civil life on the citizen-life is a *reaction* of the popular thought on itself, according to the amount ot thought focussed in public institutions, or more rigidly in civil law. It is a reflex, co-ordinated at the centre, and returned by many lines of distribution to the circumference. The spring of all social life is traced to individual life. The full fountain of Civil Life is in the popular thought, having its motive forces guided by those who have made themselves the leaders of the people. In all the greater movements marking a historic crisis, these men are the rulers of progress, not those who hold official rank and influence. Only in rarer junctures are the functions of original thinker and official governor combined in a single personality, or even in a group of wise men, directing a grand evolution of national life. It is not philosophers who rule the nation, but men of practical insight and burning enthusiasm. Yet, even within each short cycle in the life-movements of the race, individual thought must be in advance of the general thought, in order that general thought itself may become higher. There are 'reformers before the reformation'; in

advance of them, are the men who lead the reformation itself. In a quieter period beyond, there is a season within which the new thought is assimilated and slowly incorporated in the national life. The world can never fail to note what the great thinkers and administrators, and the resolute men of action, have done for the race, in securing intellectual and social advance in the history of the nations.

By far the most striking illustration of the evolution of modern thought, is the social problem of our day. In the nature of the advance it implies; in the thought-conditions by which it has been brought so prominently into our modern life; and in the historic evidence of its preparation, this problem becomes an illustration and test of all that has previously been said as to the characteristics of Thought-progress. The root from which the modern problem has grown can be traced to primitive thought; its historic preparation appears continuously in the struggle lasting through all the ages. Its origin is in the claim for personal rights—essentially, the rights of man; in the contention of one clansman against a brother clansman, owning submission to the same Chief. The progress of thought concerning these rights manifests itself all along the course of history, in the conflicts, whether between a despotic ruler and his people, or between a dominant class and a subject class. A typical illustration of this conflict, placing it before us in concrete form, appears in the familiar struggles between Roman Patricians and Plebeians. The struggle has been continued persistently through the centuries of the Christian era; it is, in large part, the unfolding of human history. The root-thought has grown all the while, taking deeper hold on the soil, and sending up its branches in all directions. The modern problem is the primitive problem, only deepened and widened, growing now, in accordance with all the changes which modern progress involves. Environment, as existing in early times, made the conflict in all places a struggle for vindication of personal rights against extravagant assumptions of civil power. Our observations are brought down to a later period, when the conflict assumes the form of a struggle of the people, including civil rulers, against the priestly influence;

and, more recently still, against the concentrated dominion of the Church. Carried still further down the stream of time, the movement has in the heart of it, the longing for freedom of thought and action, for free work and equitable reward. The primitive claim for natural rights is at the basis of all this. Thought, when it comes openly into the field of conflict, and attempts to become more precise, in accordance with the spirit of a scientific age, develops its plan of operations,—shaping for itself the *modus* by which advance is to be gained, and by which security is to be had for the gain achieved. Such thought is often quite seriously astray. It is lured to methods which seem expeditious, commonly entitled 'Thorough,' but which do not carry within them the promise which is hoped for. Thus it happens in the history of human progress, that action often produces reaction, and progress is effected still more slowly than in the history of organic advance under cosmic law. The individual man can see with comparative ease, as did the primitive man, what is his *own* interest, as expressed in a natural right; the object comes easily within the sphere of the *minimum visible*; but when rights of individuals are interwoven in a vast community, as they are in the growing complications of industrial organisation; and when common thought must reach matured decisions as to methods; it is clear that action and reaction are inevitable, and that progress must be slower than in the history of animal life. 'Survival of the fittest' is settled in the conflicts of animal passion, under conditions which give the ascendency to muscular strength; but the process is slower, because conditions are more complicated, when the end is 'the fitting of as many as possible to survive,' and to live with experience of the largest possible amount of good. This contrast only needs to be stated, in order to have it made more clear, that all human progress must depend on the slow expanding of *common thought*, harmonising individual rights with all the complexities of social organisation, and by this means bringing the common motive forces of humanity into vital accord with its Thought. The whole animal creation, including here the higher mammals, has its history *determined for it*, under the action

of fixed law. The human race has its progress *intrusted to itself*; and this is to be gained by understanding of the laws of moral life, and regulation of conduct in view of them. Accordingly, its progress depends on the expansion and self-rectification of its own Thought, as that determines effort, which must bear not only on individual ends, but also on common ends. Humanity is not, however, transferred from the animal kingdom; for, while holding the highest place within it, and that essentially a governing place, it is subject to all the laws of animal life. But, at the same time, as the specific difference of the race, Thought rules in the Life as the grand essential for progress; Humanity possesses rational power as no other living creatures do. Man cannot be governed by physical force, any more than by mere authority in civil organisation. His own motive forces must be directed and controlled by his own thought. Entering into understanding of his natural rights, he comes to know this necessity, and ultimately gains fuller possession of his rights. Man belongs to a rational kingdom, to which he and he only belongs, of all the life abounding in Nature; for no other life has fellowship in thought, and co-operation in its practical application. For Humanity, the determining law of progress is the measure in which the common thought of a people, and ultimately of the race as a whole, comes to recognise the rationality of individual rights, and to realise them in social organisation. If this be duly appreciated, it will clearly appear how it has happened that social advance has been so slow; how large a part of the work of advance is yet to be achieved, even with all the advantages which modern thought supplies; and how the security for a steady advance, casting enlarged benefits all around it, ever more widely as it moves, depends upon conceptions of right and wrong being worked into the social fabric, expanding moral and religious sentiments, and with a slowly developing popular enthusiasm, proving itself increasingly true to Nature and to Nature's laws.

This grand end will be more directly reached, in proportion as the lessons of history are read and applied. Nothing must be allowed to disguise the grand law of human

progress, that social advance depends on advance of Common Thought. To the leaders of thought, we continue even now beholden as in past times; but now, as formerly, the people as a whole carry with them,—strictly speaking, within them, —the forces which determine progress. In this lies the true meaning of social dominion as related to development of social life. It can lie in no other form. Everything divergent from this only misleads in the field of practice, and in the field of philosophy lands us in foolish admiration of an abstraction, placing within a frame a modicum of the true grandeur of human life. In opposition to such representations as these, we must return to the view which Nature gives, and which History illustrates, of the power of individual thought, the rightness of the claim for freedom in thought and action, owning the moral and religious health and force of that longing, which begins to possess our race, for a larger and freer distribution of all the good required to satisfy a rational nature. 'Social progress means a checking of the cosmic process at every step, and the substitution for it of another, which may be called the ethical process; the end of which is not the survival of those who may happen to be the fittest, in respect of the whole of the conditions which exist, but of those who are ethically the best.'[1] The full light of heaven does not lie on the social problem of the day, unless we mark everywhere the evidence of Moral Rule, distinct from all Civil Organisation, independent, transcendent, yet immanent in Nature, appearing where Man is, however lonely he be, however simple his social surroundings, however numerous the institutions, and elaborate the political organisation of our great modern nationalities. If our observations be steady, wide reaching, and reasonably appreciative of the forces favourable and adverse to human progress, we must clearly see that there is in Nature a veritable 'retribution,' slowly laying a strong, irresistible grasp on the wickedness, passionately expressing itself in noisy shouts for liberty, even while steadily sinking into bondage. It is not 'sanctions' of law I speak of now, though we find a true meaning in the word, for there

[1] Huxley, *Evolution and Ethics*, p. 33.

is law for all life, for the rational as for the organic, and there are uniformly sanctions for all law; but I speak of a grand Invisible Power which is throwing over individual, family, and national history, a restraining force; putting limits around human wickedness, as around the waters of the sea. The word 'degeneration' is writ large over the pages of science, and the evidence of it is everywhere in human history, with its sad tale, and sadder experience, individual and social, of the power of Evil. The human race, notwithstanding its elevation,—notwithstanding the effective things written as to the 'flower of the ages,'—has not been exempted from the laws of heredity, with their checks, as with their securities. Laws of health are laws of life, and these make war against all dissoluteness.

There is also the converse, for nothing in Nature is single; from the primitive distinction between right and wrong, we trace dual phases of human experience, which, even while we are constantly speaking of them as variable, are truly fixed, strictly defined by law, and maintained by a power greater than ours. Every man knows,—I do not say every *good* man, for that were only a part of the truth, though the greater and higher part,—every man knows that there is helping and reward in welldoing. Nature's forces move with the moral sentiment and effort which contribute towards fulfilment of our obligations. There is, as we all see more or less clearly, 'a power which makes for righteousness,'—accordingly, we are constrained to own that there is reward for welldoing, however little strivings towards an ethical ideal may be noted by our fellows. Uncivilised tribes yield their quota of evidence. All the greatest nations of the modern epoch, however moved by increase of wealth, are made to feel the sweep and force of a higher and grander law of progress, which absorbs the laws of material gain, and goes far beyond them in maintaining a nation's history. The disappearance of the splendour of Greek wealth and wisdom; 'the decline and fall of the Roman Empire'; the rise and progress of Western nations, and the growth of the ethical spirit which unfolds before us a grander ideal of social progress; when brought together in the light of historic relations, give us

at once the lesson of warning and the lesson of hope. There is a Power in Nature which wars against wickedness, and which works for righteousness.

Even with all the achievements of the modern epoch, we cannot bear to be parted from primitive thought and life. There is a 'Roman severity' overhead, which first forces into view our relation to the animals, and next brings us to own a large indebtedness to primitive man. As manhood must own its relation to childhood, so must the race own and honour its ancestry; and in this ancestry that which is most conspicuous is the evidence for the presence, in primitive life, of the root-thoughts, which continue living in our times, sending up vital energy to the tree which has grown to large proportions. Even if we admit with Darwin, that Nature has given to man 'a pedigree of prodigious length,' the several orders of Apes are of singularly little interest to us; the best chosen words of our author, designed to awaken such interest, sound in our ears as the words of a theorist, rather than the words of a naturalist. Again, when our attention is turned towards 'the external characteristic differences between the races of man,' we are being led far off from the sources of modern advance. In this line we are turned away from the points of main interest; if we follow, there seems nothing in the state of evidence to make us reluctant to own that these 'external characteristic differences' 'may have been preserved and augmented during a long series of generations through natural selection'; but withal, we accept Darwin's conclusion (with some slight reservations, so as to include differences of climate and temperature) when he says, 'So far as we are enabled to judge, although always liable to err on this head, none of the differences between the races of man are of any direct or special service to him.'[1] So this digression takes end. With a clear highway behind and before, we see that the Thoughts influencing primitive man, guide straight to the developments of modern thought, and even in this day give us the promise of the future we anticipate. If the time draws on when a deeper sense of the brotherhood of man will be cherished,—and modern life is throbbing with ardent

[1] Darwin, *Descent of Man*, p. 198.

longings for it,—this will come when the root-thoughts of primitive man have found their rational unfolding, and their true application, in the very midst of the daily thought, the industrial organisation, the system of law, and the pervading influence of constitutional government, which work together in the midst of our modern life.

Along this highroad of progress we are moving slowly. Endless obstacles are lying in the way, as if the fury of a tempest had torn the trees of the forest from their place, and strewn them athwart the road, all to be removed, or, it may be, trodden into the soft soil, as pioneers at times make roads, in order that resistance to progress may be abated. But one thing is being made apparent, and needs to be insisted upon with increasing emphasis, that social forces, important as they are, are at best auxiliary, and not the primary source of the progress of our race. Thought and the thinker present the first relation, which cannot be severed or displaced. As primitive man asserted himself among the tribesmen, even when claims of right were ill defined, so does the man of modern times, sustained by common thought, assert himself, but with more fulness of utterance, and with greater possibilities of co-operation. Individual rights go to make constitutional rights; the simpler leads to the more complex, preparing the way for social organisation; the thought of the people, cleared and strengthened by men of insight among themselves, and increasingly in modern life by controversies originated by themselves, determines social life and organisation. It is well for a nation if its rulers and administrators are also the leaders of thought and of its expression in political organisation; but not infrequently rulers and leaders are not only separated, but in some measure antagonistic. In such a case, social advance is gained by a struggle more or less tarnished with accompaniments of suffering and unfairness. Only by combining the forces at work among the people do we find the materials in human history by reference to which philosophic theories of Society and the State are to be framed. In view of this, it will appear that the theory that Organised Society supplies the motive force for human advance, must

be dismissed as a fallacy,—a reversal of the order of Nature. The utmost that can be granted is that social influences powerfully contribute towards support of the thought which has given them being. Still less can it be admitted that the State is the source of advance for the race. The imperfections of humanity are more likely to appear in the State than elsewhere in human organisation, simply because our Ideal is more difficult of application according to the complexity of the conditions in the midst of which we strive to work it out. The forces against us are greater as they are multiplied, and are aided in combined action by advantages of situation. It is one of the prominent tendencies of our age to be specially affected by large things; hence we naturally suppose that the State is the source of advance. Its true distinction, on the contrary, lies in the power, later in time, for moulding national movements and institutions, as readily as safely may be, according to the advance of Thought shaping itself among the people, while it is passing through the natural tests of criticism and rivalry of interest. The State thus gives security for what has been achieved, and is generally accepted as a true gain. But the energy moving the world is the Thought-energy, guiding the impulses of the people. The State's work comes later; its business is to gather the harvest of progress, guided by the statesmanship which traces the intellectual significance of the movements appearing in the history of the people, and forms a true conception of the appliances fitted to secure the social interests involved. Statesmen can, indeed, lead; but no further and no faster than the unfolding of national thought renders leadership possible. There is not in the history of a nation any such motive force as would make the State equivalent to the Mind in its government of the Individual Life. The nations which are furthest advanced are those in which the people are freest in their movements.

This progress of human thought, which I am now tracing, bears before it an ever Expanding Ideal. Its historic continuity, from primitive times till now, stands in marked contrast with the sudden outburst of scientific thought, late in time. In the one case, the advance comes from the

common thought of the race, making its efforts towards social organisation, and proceeding with increasing momentum as the ages multiply, each succeeding generation receiving extended opportunity from that which had gone before. The advent of Science, appearing late in time, like a new life, comes from efforts, novel and singular, to penetrate into Nature's secrets, with which previous generations of men had no concern. The true preparation for the coming of scientific thought, as to the natural history of life on the earth, was the slowly opening consciousness of disciplined minds, from Buffon to Lamarck, from Owen to Darwin, becoming alive to the fact that a deeper kind of knowledge was needed before men could reach a full understanding of the system of things. The people generally knew nothing of this great event; they have had little of the restlessness which the sense of it occasioned to disciplined observers. When, still later, we pass from Darwin to Huxley, the later thinker penetrates further and more clearly into the wider relations of scientific inductions, seeing the Ethical process as clearly as Darwin saw the Cosmic.

But we must return on the evidence that the root-thoughts of the race have from the first guided the motive forces, which have brought civilised nations towards the period when, with some approach to unanimity, they begin to deal with the great social problem concerned with the common good of mankind. How truly it is *common thought* which is moving in history from first to last will now be recognised; and this must be increasingly felt as times goes on. When scientific thought arises in the later times, it flows in upon the common current, as with the sweep of a great tributary, the two currents at first showing some power to maintain their independence, as when the waters of the Rhone and Arve are united in one channel. But this is well assured by laws of Nature, that the scientific thought of our day must commingle with the common thought before it can contribute, as it is fitted to do, to a common good. Philosophy, holding the field long before Science had put in an appearance, warns us that in order to find a rational basis for the history of human progress, we

must trace our way back to the fountain of thought, to find by simple analysis the distinctions of right and wrong, which have sustained individual claims in all ages,—which have lived through times of violence when, individually or in combination, men took law into their own hands,—which have been finding application, less or more clearly and consistently through all time, in family life, in clan customs, and in the social organisation of a more or less advanced civilisation. The phrases which are the symbols of things essential to the grand movements of humanity come to us equally from the voice of the people, and from academic discussions in which the people take small interest. Now, the word is 'common good,' again, 'the greatest happiness of the greatest number'; now it is 'supply of life's wants,' again 'Utilitarianism'; now 'justice and mercy,' again 'Altruism.' But whatever the phrases of succeeding periods, the thoughts swaying the action of men are at basis the same; and in process of time the claim inevitably grows louder that 'the common good' have a wider practical meaning.

But even when thus tracing the thread running through the ages, we must not fail to note the surrounding confusions, occasioned by prospecting and road-making, levelling obstructions and filling up or bridging intervening chasms. All along the highway are abandoned conceptions of human interests; first vaguely formed, even when enthusiastically accepted; afterwards contemptuously rejected, and at length forgotten, or remembered only as historic traces of a dead past. We have such pretentious theories manufacturing even now, and being turned out with all recommendations of surface polishing, afterwards to lie by the wayside, in fragments, soiled and rusted. A hopeless future lies before Utopian schemes proposing to treat human life as a mechanism, and civil government as the motive force for the great machine. Labour interests and interests of capital equally, meet these first with ridicule, and next with resentment. The more mechanical the theories of social organisation, the less akin are they to the greatness of human life, in the heart of which thought-power is ruling and guiding. It is a greatly better and nobler spirit which is stirring, when the

souls of men desire to reach a fairer and freer distribution of the comforts of life,—demanding that common rights should be respected and guarded; should be allowed, according to Nature's laws, to yield larger and still richer benefits for the life of Mankind.

Even the most intelligent and ardent sympathy with the spirit of the age, does not obliterate from our forecast of the immediate future, a measure of concern because of an undue eagerness on the one hand, and, on the other, excessive restlessness, because of the manifold imperfections seen all around, and also the apparent massiveness of the obstacles seen in dim outline in front. All the conditions of progress tend to enforce the warning that attainment of our Ideal must be slowly achieved. More especially, we are warned against giving ascendency to the State, within the field of rational expectation. Philosophers of the highest rank, moved by admiration of the logical symmetry of a lofty Idealism, have not only found in the State the consummation of the ethical process, but have inclined to attribute to the State the highest efficiency among the forces favouring advance. History carries as powerfully warning against the fascination of a philosophic Utopia, as against that of a more materialistic and sensuous ideal of Social Order. The consummation towards which things are moving, cannot, indeed, fall short of a grand advance in social life, and, ultimately, in the organisation of the State. But, our security for this rests in the fundamental principles underlying all thought,—which I have endeavoured to show were latent in the root-thoughts of primitive man,—and which now, as much as at any prior period, struggle, not for existence, but for dominion over natural passions, which are not to be beaten from the field, but to be disciplined and made tributary to the one grand end. Whatever be the advantages of succeeding generations, entering on the richer heritage of modern times, each one of them comes fresh on the field, with the fervour and inexperience of youth, and also with considerable measure of unreasoning impulsiveness,—native force without discipline, for discipline comes more slowly, and comes for each generation, as for each individual life, as the result of thought and

effort. Withal, modern civilisation is bringing its own difficulties, as division of labour weaves its own intricacies in the organisation of our industries first, and even of our social system itself. Our confidence in human progress depends on the root-thoughts which are at the centre of all effort, guiding the forces by virtue of which the whole race is moving. But, to the damping of a natural ardour, yet to the slow development of a maturer thought, we must note that there are many efforts towards organisation which are only tentative, and too often are born of the eagerness to reap all the fruits of toil before the passing generation has gone from the scene. 'Life is too short to wait'; so we say. Nature is ever impressing on us a larger lesson. Deaths are continually occurring among us, as well when men are in the harvest field, as when they are throwing up the furrows. Three generations of men always take the field together; and in no case can the aged reap what the young shall have, when they in turn have grown old. Faith and Patience must advance together in their united life. The Individual, ordinary Society, and the State, must together see in this union a necessity for advance. Men must learn the important, though painfully acquired, lesson,—and all Social Reformers must take heart while it is being learned,—that the worst restraints upon progress are those coming from ourselves; these are the moral hindrances, the self-indulgence, the selfishness, the cruelty, which are our hereditary foes, to be attacked and beaten, as often as they form anew on any vantage ground, and as fast as the disciplined forces of modern civilisation can be placed on the field, under skilful leadership.

From the whole range of observations as to the characteristics of modern thought, two things seem to stand out clearly. The first is that the history of human life, in all its intellectual conditions, is distinct from the history of animal life. This contrast is the more vividly presented to view, by reason of the fact that the physical nature of man is in all respects analogous to that of the animals, and is similarly subject to physiological law. The second feature is, that the evolution of thought depends on the recognition of practical

rules of life, which have been traced back to primitive man, implying a knowledge which is no more the result of individual experience than is the instinct appearing in animal life. When the separation of man from all lower orders of life is considered, along with the motive forces of rational life, analogous to those in animal life which are independent of experience, there is impressive testimony to the grand unity of plan unfolded in Nature. Even the lower orders of life are made in some measure superior to the experience which comes only from passing impressions on nerve sensibility. In a much loftier sense is this true of Man, who, in accordance with the special characteristics of a rational life, from primitive times onwards to modern, is concerned in the ethical process, striving to have his life, with all individual, family, and social interests, preserved and developed in accordance with ethical law.

CHAPTER XV

A GENERAL SURVEY

THE great service which Darwin and Huxley have rendered becomes apparent when we proceed to take a general survey of history, guided by the two leading conceptions of a cosmic process, and an ethical. By reference to the continuity of life's history, Darwin has helped us to see the symmetry of plan embodied in the animal kingdom. Following up this cue with characteristic devotion and energy, Huxley has carried thought further. After inclining, in the early stage of his work, to concentrate with absorbing interest on the ape-like structure of man, he passed away from this to the larger view of the elevation of a life governed by ethical law, the history of whose struggles towards rational advance belong to a rational kingdom, immeasurably transcending the organic. It was in 1859 that Darwin first published the *Origin of Species by means of Natural Selection*; it was not till 1893 that Huxley gave deliberate expression to the outstanding contrast between the cosmic process and the ethical, showing that 'social progress means a checking of the cosmic process at every step.' When a discovery such as Darwin's has been made, which revolutionises the accepted thought of past ages, the earlier form of belief, having long fixed the popular view of the history of creation, and having moulded the language of all civilised nations, it costs even our most disciplined thinkers protracted reflection to obtain a comprehensive view of the vast wealth of Nature suddenly unfolded. But after such effort, our race comes gladly to accept conclusions worked out with skill, and sustained by ample evidence. Huxley does not seem unduly to estimate the result in this case, when he says: 'Modern thought is

making a fresh start from the base whence Indian and Greek philosophy set out; and the human mind, being very much what it was six-and-twenty centuries ago, there is no ground for wonder if it presents indications of a tendency to move along the old lines to the same results.'[1]

I propose now to follow up these detailed investigations by attempting to give, in brief, a general survey of the history of life on the earth, in the hope that the conclusions warranted by scientific research may be harmoniously represented. In such an attempt, only a very general outline is possible; but this may suffice for gaining such a representation of results, as may give prominence to Man's position in biological history.

The history of life has its background in Nature, provided before the history of animal life began. Whether the picture of advance be only in outline, or more fully worked in by inclusion of its details, the background is definitely fixed. This has been advanced and completed through Geologic epochs, carrying forward a course of preparation for the advent of animal life. Having here such life more especially in view, we fix attention primarily on the prominence of *vegetable life*, within the field of action allotted to the animal creation. In the vegetable kingdom, we have, in accordance with the striking witness of modern science, provision for the animal kingdom. Glancing on this phase of still life, we are observing Nature's manufacture of supplies for superior orders, all to be dependent on the lower. Without overlooking the beauty which first attracts the eye, the variety of form, the blending of colours, the light and shade spreading over the landscape, we see through all this, and in it all, utilities clothed in these beauties, for 'plants can manufacture fresh protoplasm out of mineral compounds, whereas animals are obliged to procure it ready-made, and hence in the long-run depend on plants' (*v.* p. 22). The illustrated pages of the book of Nature have a deeper significance than the artistic eye discovers; the scientific eye has come later to verify the significance of Nature's background, the value of the vegetable kingdom for the history of animal life.

We pass from this to seek our proper standpoint for

[1] Huxley, *Evolution and Ethics*, p. 29.

appreciating the picture as a whole, anticipating also possible need for shifting our position from time to time, that the varied features of the picture may be appreciated. In the first instance, and for a considerable time during our observations, our standpoint must be the scientific one, especially as this may enable us to notice features otherwise concealed from the observer, but unexpectedly discovered by the breaking of a strong light over a portion of the landscape. The uncovering of Nature's secrets is the grand achievement of modern science. By this, attention has been concentrated on points where previously the human eye could detect nothing more than the movements of life. Along with the apparently inactive life, there has always been, full in view of man, abundant illustration of an active life, which has from the first proved attractive. There has ever been for man an interest in animals, large and small, if in some cases a shrinking on account of their presence being the reverse of attractive. The general experience of human life has, however, led man to own something winning in the movements of animals; although our search for supplies of animal food have developed antagonism more than appears in love of the chase. But now it will be felt that one of the indirect effects of a general acceptance of the theory of organic Evolution must be to give us a deeper sense of our affinities with the animals, and to induce a more intelligent and kindly regard to all their sensibilities.

But these outward relations do not so much engage our thoughts here, as do the *secrets of life*, which recent research has brought into view, more especially those which concern the development of the individual life from *a minute germ-cell.* We here take the history of an individual life, as the Evolution theory suggests we should, in order to use it as an instrument for historic study, contributing in a practical way to the cultivation of the historic spirit. If we see clearly the hidden processes which give the history of the microcosm, we shall the more readily, and also the more advantageously, trace the progress of the unfolding macrocosm. For example, let us take the egg of the barn-door fowl. Within this egg the germ of life is enclosed, and we now know every stage of

its unfolding, until the chick cracks its shell with its beak, and runs forth to gather supplies as they lie around. This represents the unfolding of a life from its initial stage of quickening, onwards to the developed chick. In this life-history we have the symbol of the development of a wide circle of life on the earth. The energy at work, and the process by which development is provided for, are the most interesting features leading to an understanding of Nature's provision for continuity of life. In the silence of the unquickened life, there lies a potentiality waiting the action of external conditions in order that the latent energy may be started into activity. When such movement begins, there is nutriment stored within the shell, lying in readiness for the need of this young life. It is not purposive action we find here in the germ, but evidence of a purpose antecedent to the movement and preparing for it. This is the teaching of heredity in such a case, that the mature life not only provides the germ-cell, but wraps it round with store of nutriment. Unless Nature thus went before and stored up supplies, there could be no continuity of life on the earth. Yet when embryological science has done its utmost, we have only had described to us successive stages of life-forms. The mystery is deepened by being disclosed. When we see the process and its successive manifestations of result, the marvel to us is that such a germ should be the storehouse of an energy which requires only the warmth of the mother's body, or the heat of the incubator, to rouse it to action, while the store of nutriment proves sufficient to sustain its activity throughout the period determined for organic development. This germ of life within an egg stands as the type of the provision for continuity of life, in a series of regularly recurring generations of any species. Germ-life and cosmic law are ever co-operating, season by season.

From this history of an individual life, we receive the guidance of science leading towards the standpoint whence we may gain a truer, because greatly enlarged, view of the history of organic life. Cosmic law we contemplate more readily as it is known to us in the whole experience of life. The dawning of the day, with the streaming light and the

growing warmth, conquering the coldness and the shadows of the night, reveals to us the vast storehouse of energy which has told upon all the ages in the world's history. So familiar is the experience, and so impressive the sight of his coming at the dawn of day, that primitive men were fain to worship the power in the heavens; throughout all periods of our history, poets have found inspiration from the gladdening light, philosophers have brought thence their symbolism as to the power of Intelligence in Nature; and in a scientific age the laws of light have been a leading theme for the physicist. There is, then, little risk that we should neglect the vast energy of cosmic law. A true conception of Cosmic Energy in all its manifestations is specially required now, in order that we may understand the history of Life on the earth. In an infinite number of minute cells there is stored a potentiality which fills us with wonder; when this energy has begun to move, it cannot be stayed, unless it be extinguished; and is sustained by a store of nutriment, lying ready to hand, though often inadequate in supply. Intelligence is not lodged within the unquickened cell; there has been purpose beforehand,—for the progress is certain and uniform; the stages are measured; the consummation in each case appears in a completed organism. In this way the world is peopled with minute forms of life, and, wherever placed, reproduction becomes a direct end of their being. Under a general survey of Nature, when Science acts as our guide, this vast expansion of life-energy, in endless variety of minute forms, gives us our first impressions.

Passing from these exceedingly minute centres of life,—including germs of a coming individuality,—we contemplate the diversity of species found over the world in endless variety of form, and of inner structure. Here we become sensible of the special impulse which Darwin has given to our study of Nature. We are not any longer bewildered, as men were wont to be, by the unmanageable variety, even in lower forms, such as the sponges, the medusæ, or the insects. System has been traced within this variety,—a key to possibilities and results, making environment the guide on a large scale to these minute variations which interest and surprise

us. Much has been done to expand and rectify our conceptions of Nature, even in the single observation of the tendency of animals to take on colouring according to their surroundings,—a tendency familiar in early times to a shepherd race, as seen in the old-world story of Jacob among his flocks; but known to us now as a general law of organic structure, applicable to the minutest organism, proving at once an attraction to mates and a defence from foes. But there is a still deeper significance in the facts, as we go beyond form and colour into the inner structure of the organism. There lies before us the well-ascertained truth, that the energy within each individual life is striving towards the perfection of its kind, and that, in course of this effort, the organic structure takes on an impress from environment, under the demand for adaptation. This law of life applies over the whole area of Nature, not in the immediate outcome of struggle for gratification, but in results, appearing after a long range of activity, in the slow growth of structure itself. The evidence of this has been accumulated in endless variety, so that no discovery is more full of interest, or more amply provides materials for instruction. This wide induction has for us a growing impressiveness. No better example can be adduced of the power of cumulative evidence to set a lasting imprint on the intelligence of the age. Organic life has a power of *structural acquisition*, brought into play by outward conditions acting on nerve sensibility; thus it is constantly making fresh acquisitions. That there should be also degeneration visible both in merely animal and in human history, does not obscure the lesson, but confirms it, giving it greater vividness. What depends on the external, must have its results determined largely by variations occurring outside its own being, and this implies possibility of degeneration, as well as possibilities of advance. The havoc must appear over-against the gain; an intelligent race must gather the lessons from fields on every side. But the grand outcome is *advance*, even when wreck and waste leave their traces behind. Cosmic law and vital energy retain their primitive relations. The chief dangers gather around the history of distinct species or

competing nations of men, struggling for ascendency. They are greater, and more persistently recurrent, in human life than in any lower order. It is the highest life which is most in peril of a headlong descent, and of a protracted degeneration, consequent on injuries received. It is in human history, individual and national, that dissoluteness makes its ravages, bringing upon offspring a burden in the inherited organism, and on succeeding generations a withering sense of decayed greatness. Increase of material advantages, in the midst of which the effort towards advance is abating, under the paralysis which luxury spreads over organic energy and moral purpose, can dethrone the mighty, as it did overthrow Greece and Rome. There are many and serious obstacles, making the progress of a rational life slower than the progress we chronicle in the history of structure by slight modifications; but we have with us the force and quickening power of moral and religious sentiments, sustained by all the laws of Nature, physical and intellectual. And although we must always acknowledge the inadequacy of analogical thought for demonstration of new truth, there are lessons of analogy coming from Nature's provision for organic evolution fitted to inspire the human race, when bracing itself for more arduous effort. The grand encouragement given us lies in this, that in no case can individual advance be realised, without its being in some measure helpful to the race as a whole. All Nature's movements, expressing themselves equally in ethical progress and in cosmic, are towards steady advance, even though it be by slow steps.

In our survey of the history of evolution of organic structure, a further observation lies easily within reach of ordinary vision—that is the marvellous selective power which belongs to low forms of organic structure, by reason of its sensibility. This appears even before the advance in differentiation has become marked. This I take to be one of the most striking facts brought out by recent discoveries. Even from the protozoa impressive lessons come to us as to the work that simple structure can accomplish. There is no need for going beyond the first and second figures given in

the present volume, in order to find vivid illustration of the fact to which I am pointing. In no way more convincing can we receive a greatly needed lesson than by observing how these low orders of life behave themselves in their search for food. It seems as if the sea, affording them floating space, had undertaken to demonstrate to all dwellers on the land, how great is life-energy, even when its appliances for work are few and simple.

The sweep of our eye is next arrested by the phenomena of Instinct,—phenomena so many and varied, as to induce long contemplation of species comparatively low in the scale, including the myriads of insects and all varieties of birds, large and small, the smaller of them being in many ways the most attractive, and the most interesting as objects of observation. A quite distinctive feature in the vast field of natural history, is visible when breadth of sunshine falls on this region. If the wonders of action by a simple organic form, as seen in an ordinary cell, or in one of the protozoa, arrest the eye of an observer, still more may interest be concentrated on the instincts of orders comparatively low in the scale of life. Sir John Lubbock's observations on *Ants, Bees, and Wasps*, have given to a large circle some sense of the importance of insect life, directing attention towards the conclusions to be reached in comparative biology. These observations, taken as the type of a large body of evidence at command, must help us in shaping more adequately our judgments of the possibilities of mere organic action. Besides, if these are patiently considered, and are placed in comparison with our own familiar exercise of Intelligence as it interprets the facts of experience, they may aid us in securing more accurate views of the distinctive features of mental action. The protozoon, wonderful as it is in its work, seems a comparatively insignificant representative of organic activity, as according to its rank it must be, when we witness the industry of the bee, of the ant, or of any one of our small singing birds. The marvel here is not what can be achieved by simple structure, but what the individual organism, subjected to the discipline of environment, can show vested within it as latent power, often coming to view,

as in the history of birds, at the nesting time, then sinking back again to quiescence, as soon as this nesting season is past. If, in our age, the rational power has good reason to boast itself of its grand achievements in the interpretation of Nature, it must, on the broad basis of these, allow that it is forced to express its admiration of the work accomplished by the tiny builders in our forests. In their case, where it proves impossible for us to carry through our observations, as was done in the case of the cell, it is more difficult to give definiteness to our conceptions of method. The certainty of the results leaves it open to us to form a general conclusion. We can place a cell under the microscope, and, without the slightest disturbance to its movements, we can observe and record them. But this proves impossible while we note the activities of a mature organic life, even though it rank no higher than the order of insects. Here we part company with histologists and physiologists, and are driven back on the common observations of naturalists. What is seen of instinct, proves exceedingly instructive in the field of comparative biology; and it is all the more so, that it is completely removed from the intervention of man. Where long stretches of moor are spread out before us, shining in the brilliance of the purple heather, and thousands of bees maintain an industry all their own; across the stream, where appear the boundaries of the pine forest, which is stretching for miles onwards far up the hill, no trace of bees may be found, but the ants are there in myriads, gathering the pine-needles, caring for the pupæ, and bringing in stores to the ant-hill; and the birds are overhead, nest-building, in these quiet and remote regions, where even the tread of the forester is rarely heard,—for forty years of growth are required before a forest of timber can be reaped,—unless he come to enclose the forest against the flocks and herds scattered over the moor. Unobserved by man, what a life of energy is here,—what fruits of industry,—what triumphs of building art,—what persistent activity—in comparison with which the life of the anthropoid ape is insignificant, supplying little to stimulate our interest, or to awaken our astonishment, unless these concentrate on its muscular

development. What here arrests observation, and fills the mind with wonder, is the Instinct of these bees humming among the heather,—of these ants travelling eagerly along their beaten highways,—and of these birds flitting up and down, gathering materials for a nest, which they do not build for themselves, but for offspring to come. Man does not interpose with a hand's turn to help forward this industry, nor could he if he were ever so much inclined; but the meaning of it all needs to be seen, and deliberately regarded, if we are to speak, as instructed witnesses, as to the Evolution of life on the earth. It is a special view which is lying before us of the grand cosmic process; for this portion of the field of Nature has characteristics all its own.

Nature has, at this stage, worked up to results which are to us a marvel, akin to that we had seen in the first movements of the quickened cell. But the imprint of Nature's touch and teaching is now on the mature life; we see action in the open, not under the membrane which covers a cell, or enveloped in the nutriment providing for a germ in the first stages of its development. There is here not only a capacity of sensibility such as we have witnessed in the pigment spots of the medusæ—germs of coming organs of vision—but a power of activity which depends on long impression made on organic forms, and transmitted in the line of heredity, so giving persistence to species. The fact that the action of cosmic law is uniform, while results so varied in organic life come out to view, must produce a deep impression on us. We see the difference of result partly explained in difference of environment—in varying demands on life-energy for its own satisfaction—in Nature's separation and classification of the germ-cells of the vegetable kingdom,—and in man's intervention providing for improved conditions. But we see in a common result, which we name animal instinct, the provision which Nature makes within the mature structure, and in course of its history, for the doing of work which can be achieved only by distinct species. It is in this way, aided by discovery, that we are being taught the lesson that Nature provides for work of other kinds than ours, and accomplishes advance in other ways still

past finding out, for we do not succeed in completing our knowledge here. But, even while marking the limits of our knowledge, we gain deeper insight into the wisdom to which cosmic processes are ever bearing witness. Even within the silences of Nature, we see an intelligence looking forth upon us, and speaking to our intelligence, as a definite purpose is being worked out in the history of organism. In provision for the continuity of species, Nature ordains that the mature life supply germs for reproduction of its kind, and also impulse for reproducing within its offspring a powerful Instinct which will prepare for the need of its offspring, in a stage of succession yet to appear. This inclusion of the interests of *three* generations in a single mature life bears impressive witness to the Intelligence immanent in Nature.

Next, under guidance of Science, we are being led further back and higher up, to witness increasing complexity of life, —to find marked diminution of instinctive force, along with evidence of animal intelligence. Here, we are still only observers of Nature's working. Knowing what Intelligence is, we note its first appearance. It comes on the field, and, apart from man's intervention, does its work, as distinctively as the power of Instinct in the life of insects and birds. Man is nowhere visible over the face of the earth. To the theory of Evolution we are in no small measure indebted for supplying this important lesson for education of modern thought. Intelligence has come into view where there is not a trace all around of the presence of a higher organism gifted with a Rational Intelligence. All that Darwin observed so closely in phenomena of domestication is quite invisible here; no trace of man's dwelling is seen; no sign over the vast expanse of the homestead, so attractive to us, with shelter for cattle, and stores from the harvest field stacked close at hand. From the standpoint we occupy now, the higher mammals appear most conspicuous, representing the slow evolution of organic life. These are the sole possessors of an intelligent life, capable of seeing dimly the relation of means to ends. Animals exercising this primitive phase of Perceptive Intelligence appear in many directions, and in varied

forms, over wide continents, in all recesses of the primeval forest, and over vast stretches of wilderness regions, where the camel is resting, where the elephant is browsing, where the wolf is hunting. At an earlier stage in this investigation, when marking the contrast between the Perceptive Intelligence of the animal and the Rational Intelligence of man, we selected the dog and the horse for illustration; but this we did because of their proximity to us, and the advantages of close observation of their action. Logical considerations, not historical, determined the selection. Now, other species are the objects of attention. Neither the dog nor the horse appears within the range of vision from the standpoint we now occupy. These belong to a later age; they are the products of a period when man has appeared on the scene, when human intelligence is acting as a new factor in natural history; the age to which these are to belong is still in the unknown future. By testimony supplied within the structure of these two animals, it appears that a long series of organic modifications had prepared the way for their advent. Besides, present-day observations show the impress of human training; these are in a sense 'civilised animals'; they belong even to our modern civilisation. From the historic standpoint occupied at this stage of our general survey, these two animals have *no place* within the field of observation belonging to natural history; we cannot have a suggestion even of their absence. Evidence of existing intelligence appears in animals of more primitive form, whose historic position is explained under cosmic law, as simpler structures have already been explained. But, under these conditions, by action of some additional agency not observed in action, Intelligence has appeared, here and there, over the wide field. We distinctly trace a new power. Long antecedent to man's appearance, the action of Intelligence is clearly visible from the historic standpoint we are hypothetically holding, under warrant of scientific evidence. Its appearance does not seem traceable to the evolution of organism, which has long occupied the field. This Perceptive Intelligence shows itself in diverse organic forms,—there in the jungle, here in desert places, far away in the regions of ice. These supply the key to Nature's

action, illustrating a striking advance. Cosmic law is clearly operating in continuity, for production of these varied forms; but to our eye there is no apparent affinity, except in structure, between these higher animals and those inferior —no such affinity as serves to account for the signs of Intelligence now observed. Cosmic law, such as appears leading onwards to morphological results, and to physiological adaptations to climatic conditions, meeting other tests of environment, continues a fixed condition in biological history; but some other energy is at work in the genesis of Intelligence. Judging of comparative results by reference to cosmic epochs, a certain portion of the animal creation is proved to fall back into the 'modern period,' inasmuch as many of them have followed the advent of man; they gather around his dwellings; they have had their whole development in scenes where man stood before them as the prominent figure. Such relations have no place in the scenes our eyes sweep across, from the historic standpoint where Intelligence first appears. Undoubtedly, the progenitors of the animals thus relegated to 'the human period,' were earlier represented in more primitive forms; but the later forms, shown in the dog and horse, had their periods of evolution yet to run, and not till a later age, when man had planted his foot on the soil, and had for long made his influence felt, did they appear as they are now seen by us,—'domesticated animals,'—having in their own history the influence of a home; and, still more important, near by them human homes, and about them, day by day, human influence, such in character that we have come to group these and other animals in contrast with 'wild animals.' But from the historic standpoint at which we have been halted for a survey of the scene, 'tamed animals' have no place in creation. They are absent from the valleys and hillsides, as are the abodes of men. Civilising influences have as yet no place on the earth; there is only the silent action of cosmic causes. We can say with the poet, but in a new sense, which Science has imposed upon us,—

'God made the country, and man made the town.'

Travel further along this historic highway to view the facts

of *artificial selection*; we here see that man, by his intervention, working through Nature's laws, has placed on the earth many of those varieties of animal life towards which we and our children are most attracted. When man had come, animal life could not subsist in severance from him; could not fail to take on some new shades of colouring from an environment altogether new, as the fish in our rivers become brighter, glistening as they rise to the surface, because their habitat is over a channel of polished pebbles, on the edge of a 'silver strand.' These varieties, associates of man, are absent from the primitive period, where silent forces are producing their influence on the conditions of animal life, when the noises sounding along the hillsides and glens are those of the winds and the rushing waters, and at greater distance the swell of ocean waves as they rise in height, or sigh in their retreat from the shore. What sounds of life are there, are the answering calls of all manner of beasts, as they tell of sense of the agreeable, or sense of danger; and ever and anon sounds of animal strife, as the struggle for ascendency is maintained, which is first a 'struggle for existence,' and further a struggle for gratification of fierce passion, leading to 'survival of the fittest,' and this unconsciously preparing for biological advance.

In all this, we reach our conclusions by reference to manifest structural modifications, unaided by time measurements. 'There are no data whatever to justify the Biologist in assigning any, even approximately, definite period of time, either long or short, to the evolution of one species from another, by the process of variation and selection.'[1]

Now, moving upwards, we shift our standpoint once again, —climbing to a situation whence we descry features till now beyond our range of vision. Here is a Higher Life, higher even in the evolution of its organic form,—for this is the fact which first arrests attention; but, higher specially in this respect, that a Rational Life has appeared, whose coming has changed the whole aspect of things in Nature. There are new sounds on the air, new abodes on the plain, and new work on the soil, as if, beneath the surface, something

[1] Huxley, Preface to *Discourses Biological and Geological*, April, 1894.

had become visible to eyes not seeing *farther* than the animals see, but seeing *deeper* into things. All this that is new comes from a dweller who not only understands, but thinks, and tells his thoughts, which are springs of new *feeling* within life, waking sentiments of the beautiful, of the sublime, of the true, of the holy. The distance between this life and the highest on the line of approach, is enormous; the transition is startling. The historic observer must feel it to be so. It is the strangest thing in all this wide survey.

Now it appears that a stupendous change has occurred, in comparison with which effects of the rushing waters of ages gone by are trivial. No accretion of small details is here, which may grow big in course of coming centuries; no transformation around in Nature, even though in all that is fixed there are great possibilities, with prophetic warning of changes yet to unfold, lends us sensible help in our attempts to understand the large difference which has occurred. A new appearance arrests attention; a new power is here, a new Life, a new 'capability of god-like reason,' of which 'natural history' had given no premonitions, a power seeing above and beneath, besides 'looking before and after'; gazing upwards on worlds, beyond its own dwelling; searching into the hidden things underneath the surface; striving to find things which do not appear. Even more than all this, it is a Life self-directing, in a new sense, guiding its movements by light of Reason,—a light now shining for the first time on the earth—a life finding a meaning in *work* which never before was included within the history of Nature's incessant struggle, and showing that Work can become, under Nature's hands, a grand producing power, waiting on Nature's leading, walking by Nature's guiding, for Nature's education is suddenly more than doubled in range, when sight becomes partner with industry. And now, in the world's history, Work is ever growing larger in meaning as centuries unfold; work industrial and inventive, bringing larger aid of mechanical contrivance around it; work surveying earth's surface and pushing out its engineering projects and efforts; work seeking earth's stores, in mines of wealth, or in regions remote, where favouring suns

bring forth large harvests of grain and fruit; work in accumulation, organisation, distribution, incessantly proceeding as the earth becomes a place of busy marts; and work towards a truer and deeper understanding of things, for advance in rational life itself, which may find expression in literature and political organisation, in science and in philosophy, in expansion of our moral sentiments, and in uprising of religious zeal. Scenes here lie so near to us, and are so familiar, that descriptions become trite; nevertheless, the witness of comparative biology needs to be gathered and interpreted; some effort must be made to secure that our race sees its own historic place and destiny; and this is the task now required of us, in an age when science is speaking as if she held an authoritative commission to be the teacher of later ages.

Difficulties are many and serious, as we attempt to meet these present-day demands. We naturally feel rather impatient of references to the Apes. We have the feeling tingling through our veins even as we write. The anthropoids would blush, if only they had the capacity to do so, while the arguments of savants are being translated into Garner's Vocabulary, and the sounds of these are caught and imprisoned in the phonograph, to be carried across the waters and into the heart of the African forests, there to be let loose among the monkeys. Our impatience of the suggested alliance between us and the Apes has strong backing from reason; nevertheless, to yield to it is not wise. Let us be patient, as Nature trains us to be, and as wide in observation as Nature itself. We recall Huxley's warning word as to Nature's 'Roman severity'; we yield to prescribed discipline; but wisdom can be gathered, as only man can gather it, on this single condition, that we see our lofty nature, in contrast with the lowly—Mind, over-against Organism.

What else could Science do than work out the natural history of structure? If she has found its outlines in the slow, long-drawn movements of organic evolution, proceeding under cosmic processes, we can well afford to stand on a promontory overhead, whence we may see all the plain stretched out to view. We need not shut our eyes to that

which is above,—we need not deny our Consciousness, telling us every moment in our existence of the nobler life we have, —of 'the godlike reason,'—the longing for a better part in the kingdom of righteousness, of which Ancient Philosophy spoke,—the hope for a life beyond this, where environment shall be after the manner of a life expanding toward its maturity, a life to be realised in grander expansiveness, as it is surrounded by a grander environment.

The hard things which modern thought has been asked to accept under teaching of science are indeed not a few; but they are lessons of Nature's teaching, and any boastfulness we had over human greatness, consequent on ignorance of these lessons, can be intelligently abandoned, while accepting in fuller measure what had always been to some extent recognised. For, it must be observed, our place among the animals has never been overlooked by us; it could not be a thing uncertain. What is new, as seen from the standpoint of our present survey, is the continuity of organic life on the earth; the slow and gradual preparation for man's coming; and at length an organism so marvellous in its structure, that it is manifestly prepared for being tenanted by a Rational Soul. The entrance on such tenancy (it is no more than this) has no explanation from science; as the advent of the rational is no matter of vision, but is demonstrated by historic evidence. But progress of structure being matter of vision to the trained eye of observational science, Reason's vision is not closed in by man's dwelling-place here. If primitive man is contemplated from our highest point of historic survey, it is primitive *body*, as well as primitive *mind*, which appears on the earth; and as history unfolds, these two phases of life react upon each other towards further advance. Brain becomes largely developed under the influence of intelligence, as Mind prosecutes its work, searching for knowledge. This is now clear from the vantage ground of modern thought, for development of Brain goes forward under application of a new agency, and advance is made on every side, so soon as a rational intelligence is at work. So long as we fail to mark that brain development shoots ahead of all that is achieved under action of the cosmic process, our reading

of Nature's procedure still remains confused. Besides all this, here for the first time appears evidence of the culmination of the system, giving completeness to the Cosmos. The evidence to some extent spreads out to view over the fields already contemplated; for rational life, in beginning its work, is *widely* effective, influencing not only lower orders, but even the face of Nature itself, extending also upwards along the lines of self-development, spreading out to view the changes which civilisation brings, which are subjects of constant remark for each of us, notwithstanding the short space we occupy, during our brief season of work here. Slowly, but with a persistence which presents ever widening evidence of the new movement, the presence of man is producing its impression on all orders of animal life, and even on all parts of the earth's surface. In a sense we must say that the face of Nature itself is being changed. As the age of primitive man is followed by centuries in which the forces of civilisation are added to the powers which unitedly make history, the scene passes through transformations which cannot be witnessed by any single generation of men. The change is great, indeed, for men themselves are agents everywhere in the busy scenes of effort. On this account, they cannot be favoured with a full sight of what is transpiring, any more than soldiers in the fight can see how the struggle develops, for they know but a little of that which is near them, and come to know wider results, only when shouts of victory are rising along with theirs from other battalions alongside. It is, therefore, only when history is interpreted by those who carefully estimate the forces at work, and the combined results, that we, as readers of it,—not as agents in it—get our eye brought to focus, witnessing the grander effects. The expanse is in natural outline such that it could not be brought within range of a single observer, as in its natural dimensions it must continue impossible for any canvas. Our artists, limners or historians, even with their best endeavours, can work only on a reduced scale; but theirs is effective work, without which we could not intelligently contemplate historic progress unfolding in the immeasurable Cosmos.

The outstretching scene being so vast, we must be prepared to view it in divisions, returning again and again to familiar points of contemplation. When this is done, we find how often it proves needful to readjust our conceptions of Nature,—even of the life which is there,—for ultimately we must allow boundary walls to fall away, that we may look upon the One Kingdom of Life. The differences are grouped in distinct orders; but in the field of activity, the several forces are crossing each other, now in co-operation, again in antagonism, and ultimately wider issues appear, in which the unity of plan can be deciphered. The web of life shows inwoven upon it large variety of pattern; only when it is extended before us, does the unity of design become manifest.

At length, within this great kingdom of life, we concentrate on Man himself, as the crowning and conspicuous figure in it. He is the centre of dominion within the entire kingdom, himself participating in all that belongs to the kingdom, as no other order does. Not even his 'mammalian congener' is a sharer in the aptitudes, giving to him his unquestioned dominion. Nevertheless, the closeness of his relation to animal life is obvious, all the evolution of organism having led on to the marvellous structure of which he is sole possessor; still more obvious is his superiority to all animal life—a superiority manifest to men themselves, even through all the ages, before it had been possible to trace the history of Organic Evolution, or to speak of descent by structural modifications.

In the union of a physical nature with a spiritual, we find the scientific, as it is the historic, explanation of the mixed characteristics of human life, with its expanding possibilities. We are able to understand how it should happen that animals,—even the highest among them,—so soon come to a stand-still, while limits to his progress are neither seen nor felt. In the same way, also, we understand how it is that all human life has its weak aspects and its noble; for illustrative facts are not accounted for by reference to the limits of our powers, but by reference to the blending of forces so diverse that the one class is lower in nature, the other higher. Not within the possibilities of the animal life, but within those

of the rational life, do we find the centre of the activities which point to unceasing advance. On the other hand, our statement is not true,—not even coming near to the truth, —if we speak of the wonderful organism we tenant, as if it were unsuited to our higher nature. By contrasts between the animal and rational, we get to know our relative place; but only when we have contemplated their correlation and co-operation, do we truly understand humanity. It is, as we have seen, when the Rational takes possession of the organism, governing the physical as a whole, and moralising it, that we get to see what a noble instrument our organism is, throwing out innumerable lines of sensitive communication with Nature, and sending forth lines of control, so that even muscular tissue works at the bidding of a spiritual power. This is human life. We have seen it in detailed scrutiny of Structure, on the one hand, and of Consciousness, on the other. To understand it, we must see it, under all varieties of conditions, and under all modifications of structure, due to climatic influences, to industrial pressure, or to gains of civilisation, which can be set over against attendant losses. We must see it where attractive homesteads are settled on the landscape; where fields of toil are open to view; where expansive roof covers the multitudes of 'hands,' while artificial light is often blazing above the busy scene; and where the vast crowd, swayed by powerful sentiment, listens eagerly to the commanding orator, who is greeted with passionate plaudits. Human life is, indeed, a strangely complex thing, not easily kept in position, while observational science goes on scrutinising; not well understood by ourselves, as we move along our special lines of effort, meeting our full share of advantages and disadvantages, passing through defiles rugged and gloomy, and over meadows and uplands, sparkling in beauty, or luring the gaze upwards to the fastnesses of the rocks. In illustrating the myriad diversities of Human Life, it is altogether too small a thing to say that 'one half of the world does not know how the other half lives.'

Even if we contract these lines of observation, so as to concentrate attention on things close at hand,—even on a single life such as we ourselves enjoy, and for the outgoings

of which we are responsible—it is difficult to see Life's inner workings, so as to appreciate how great it is. We are at once observer and observed; so much engrossed with what we notice, that we hardly see how far above animal life is the activity in which we are engaged, throughout every hour of the day. There is, for every conscious life among us, a constant flow of experience, determined by endless wealth in Nature, and a constant outflow of influence determined by the stream of thought, emotion, and sentiment, issuing from Mind. From the central power in human life, there comes the evidence of a dominion at the heart of things, greater than the cosmic forces themselves. Let us not accept slight and superficial accounts of Mind-action. Such action is not mere sensory impression made at the periphery, or on organs of special sense; it is not transmission of images, borne in on Consciousness by dominant forces of Nature, which in turn do the work of life; man's work is done by hidden deliberations, the thought being slowly worked out by force of intellect. Such deliberations accomplish the things most noble in human effort, and greatest in human achievements. Any single life will bear witness to the reality I am now directing attention upon, as the key of all human progress, whether it be comparatively narrow in range, or so far-reaching as to rouse enthusiastic admiration of the people.

What, then, in brief, is the survey of Human Life, from primitive man till now? It is the unfolding of ethical conceptions, bearing onward the great forces which have preserved among early tribes the rights of man, and have established these rights in the civil organisation of modern times, when the blessings of a law-abiding people are recognised, and the brotherhood of man is being felt even more than it is owned, under force of a social impulse, gaining in momentum as modern thought advances. If we ask how these latter times stand related with primitive times, when thoughts as to the majesty of law had no place, and when communication of thought was restricted to the very simplest forms, the answer is clearly this,—it has been by the appearance of a succession of governing races, each coming on the scene with the fresh vigour of youth, each possessed by a passion for

conquest, and each disappearing from the scene vanquished by its own success, to be followed ere long by a new race pushing its way to the front. At length, in process of social evolution, there has come a time of stability, when great civilisations are concentrated in modern nations, who begin to forget the traditions of passionate rivalry, and to seek the blessings of peace, through the better rivalry of wise administration.

Where, then, are our ancestors? How shall we find the parent-form, which shall be accepted as truly the parent-life, of our race? We name Socrates as the founder of Moral Philosophy; we go beyond him to the Ionic school, for the beginnings of a philosophy concerned with the cosmological problem; conducting wider investigations, we go back to primitive man. Can we go further back? Has man an ancestry which can be traced under conditions previously determined by the cosmic process, as seen in the continuity of animal life? The answer which Darwin favours is that the Anthropoid Ape is the ancestor of Man. This answer has stood before us for many years. It was implied rather than formally avowed in the *Origin of Species*, 1859, appearing in hypothetical garb, with some misgiving in the mind of its sponsor as to the reception it might have, mainly because he still felt constrained to leave unanswered the urgent question,—'Why have not Apes acquired the intellectual powers of Man?'[1] When he penned the closing words of a book full of the most daring conjectures, he presented his conclusion thus guardedly,—'from the war of Nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows.'[2] It seemed at least open to doubt whether man was here included. If not, what of 'the most exalted object'? If he be, is he only one of 'the higher animals,' and is his production a result on the same lines with them? With characteristic caution, the author would at that stage venture nothing further than his hypothesis as to 'the higher animals.' The effect was to rouse and set in motion a large amount of critical and speculative

[1] *Origin of Species*, p. 169. [2] *Ibid.* p. 403.

thought, followed up by new and extremely valuable lines of research. Without estimating the comparative worth of the occurrences, these results followed:—manifold discussions as to the 'missing link'; elaborate papers on monkeys and apes, submitted to sympathetic audiences; and more exact handling of the questions of comparative anatomy and physiology, vital to the controversy. *Man's Place in Nature*, published by Huxley in 1860, supplied a complete view of the comparative structure of Man and Ape, which not only settled conclusively that the two forms were singularly like, but did much to establish the conviction that all organic life had been built up on a common plan, and had throughout its history been subject to common laws.

In 1871, twelve years after the *Origin of Species*, the *Descent of Man* appeared, presenting the evidence on which Darwin relied for inclusion of Man within the lines of continuity, avowing his belief 'that man is descended from some lowly organised form.'[1] In his concluding sentence he said that 'with all his noble qualities, Man still bears in his bodily frame the indelible stamp of his lowly origin.'[2] The conclusion as to 'origin' appears to be a claim for continuity of life in its fullest meaning, and yet the utterance is shrinking in spirit, being restricted to 'his bodily frame.'

From this point, the outstanding inquiry as to Man's place in Nature was being deliberately prosecuted; and as the result, two schools were gradually formed. Darwinism in its primary aspect—Evolution of Animal Life by slight modifications of structure—was first criticised, next generally accepted, and finally lauded in the highest terms as the great discovery of our age. Darwin had a correct forecast of the issue. 'When the views advanced by me in this volume, and by Mr. Wallace, or when analogous views on the origin of species are generally admitted, we can dimly foresee that there will be a considerable revolution in natural history.'[3]

In 1889, Wallace published his *Darwinism*, treating 'the problem of the Origin of Species on the same general lines as

[1] *Descent of Man*, p. 618. [2] *Ibid.* p. 619.
[3] *Origin of Species*, p. 399.

were adopted by Darwin,' but declaring his conviction that the theory was inadequate to account for the genesis of Human Intelligence. 'It is not to be assumed without proof, or against independent evidence, that the later stages of an apparently continuous development are necessarily due to the same causes only as the earlier stages. Applying this argument to the case of man's intellectual and moral nature, I propose to show that certain definite portions of it could not have been developed by variation and natural selection alone, and that, therefore, some other influence, law, or agency is required to account for them.'[1] Considering that 'the question of the origin and nature of the moral sense and of conscience is far too vast and complex to be discussed' within the limits of his volume, he follows out the line of evidence supplied by the mathematical, the musical, and the artistic powers in man, maintaining that 'it is impossible to trace any connection between their possession and survival in the struggle for existence';[2] and that they have arisen as 'a *result* of social and intellectual advancement, not as a cause.'

Still more striking evidence of the extent to which this conviction was gaining ground was supplied when Huxley gave the Romanes Lecture in 1893, *Evolution and Ethics*. In this, as we have seen, he gave prominence to the Ethical Process in Nature, as quite distinct from the Cosmic Process which Darwin had successfully traced, and on which attention had been largely concentrated. In a lucid and powerful exposition, Huxley supplied what Wallace had not attempted, still further advancing the conviction that Rational Life is a new appearance, operating under distinct laws, inasmuch as 'social progress means a checking of the cosmic process *at every step*, and the substitution for it of another.'[3]

The steady enlargement of view thus becomes manifest, and from this we may expect results quite as marked as those which Darwin anticipated as a 'revolution in natural history.' There is an opening up afresh, and along new lines, of the whole realm of the Spiritual. The gain to our age appears in the fact, that this spiritual realm

[1] *Darwinism*, p. 463. [2] *Ibid.* p. 468. [3] *Evolution and Ethics*, p. 33.

is not made to appear as a thing apart and antagonistic to natural law, but as belonging to the very system of things; spiritual forces operating in the universe, just as an Immanent Cause, is present. The lines of evidence are abundant, and they lie within easy range of ordinary observation, for human life itself—the common life of a man wherever present—is continually showing reference to moral distinctions, with all the limitations these impose on human action, and with the mighty impulse they supply towards higher effort. The hesitation, the doubt, the agnosticism which came along the lines of discovery of evolution of structure, and which for a time seemed formidable, are giving way before a conviction, which is at once widening and deepening, that the grander features in Nature are being explained from above, and not from the level of the lower orders of life. There is no longer any risk of an *a priori* argument being presented for acceptance. The argument comes fresh from the fields of observation; we are moving along a well-defined course to a larger view of Nature and of its history. This is the service which science has been rendering by the labours of the last thirty years or more.

The incidents belonging to this advance gain additional interest, when we refer to the posthumous publication of *Thoughts on Religion*, by Romanes. From Canon Gore, the editor of the volume, we learn that after the death of Romanes in 1894, he had 'left among his papers some notes, made mostly in the previous winter, for a work which he was intending to write on the fundamental questions of religion.' His occupation is the more striking, when it is remembered how strong an upholder of Darwin Romanes was, and how eagerly engaged over the whole field of observation, specially concentrating on the borderland between Body and Mind, having published in succession three important volumes, *Animal Intelligence, Mental Evolution in Animals,* and *Mental Evolution in Man.* When, further, we consider how much he was attracted towards Huxley, and swayed by his Agnosticism, this volume becomes one of many signs going to show that two conclusions are being unfolded in close relation with each other—the restriction

of Darwinism to the history of organic structure, and the surrender of Agnosticism, vanquished by the advance of scientific thought, following on the lines of scientific research. As John S. Mill departed this life, leaving us *Three Essays on Religion*, Romanes bequeathes, among his literary remains, *Thoughts on Religion*. Unfortunately, these 'Thoughts' are left in quite unfinished form, but his own sense of their bearing on his previously published scheme of thought appears from these explanatory words (p. 111):—'I now feel it obligatory on me to publish the following results of my maturer thought, from the standpoint of pure reason.' These later results were reached by him in reflecting on those aspects of human life which show that, besides observation and understanding, 'moral and spiritual faculties are of no less importance in their respective spheres of everyday life.'

CHAPTER XVI

THE APE AND MAN

HAVING brought into proximity these signs of the tendency of our present-day thought, we find more readily the standpoint we have been seeking in order to gain a closer view of the relations in history of the Ape and Man. We are familiar now with the picture of our so-called 'progenitor.' 'The anthropoid apes, as well as most of the monkey tribe, are essentially arboreal in their structure.'[1] Hence our familiarity with the picture of the Ape among the branches, as we have it in Wallace's *Darwinism*, p. 454. We see how like, and how unlike, are the Ape and Man; we recall from Huxley's descriptions, how like they are in brain structure, as shown by the two following illustrations, from the pages of Huxley. The monkey's brain is also given, from Ferrier, as in my work, *Mind and Brain*. These figures show the comparative brain structure in the three cases. But there is a disturbing feature, on account of Huxley's figures being presented the same in size. When we look on the Ape's Brain, it seems a miniature of man's—a Human Brain, on a reduced scale. We must here have regard to the unlikeness as much as to the likeness. When the resemblance in bodily form is before us in the familiar picture of the Ape among the branches, it is easily understood why the comparison is hateful to us. The explanation is not the vanity of our race; nor is it a natural resentment under Nature's 'Roman severity'; it is simply a sense of the inaccuracy of the conclusion suggested. It is untrue to Nature. The Ape is outwardly like to us,—in some respects singularly like. We should feel ridiculous if, under any rising feeling,

[1] Wallace, *Darwinism*, p. 459.

we were tempted to deny this resemblance. Most striking are the hidden homologies disclosed, when anatomical and physiological results are presented to view. But, when all these things have been noted, we see that this animal is not like to us, any more in the weakness of our nature, than in its greatness. When most we feel our weakness, our experience is one in which the animal cannot share; when

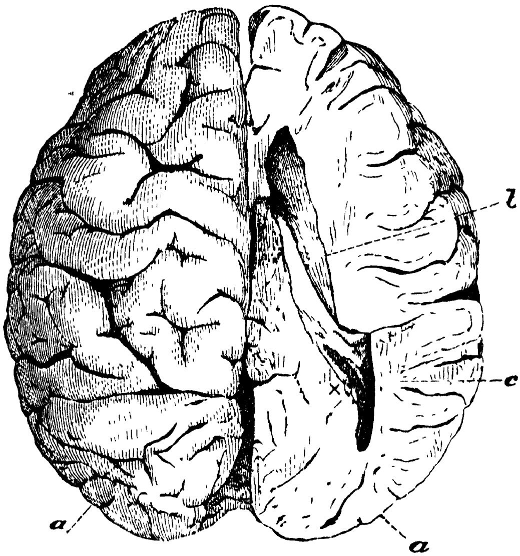

FIG. 23.—Upper view of left hemisphere, and internal arrangement of right hemisphere of the Brain of the Chimpanzee

(Enlarged on a scale to equal the drawing of man's brain as shown in the following figure.)

(From Professor Huxley's *Man's Place in Nature.*)

most we are moved by conscious greatness, we are severed from the Ape by an 'immense difference,' and so it 'would, no doubt, still remain, even if one of the higher apes had been improved or civilised as much as a dog has been.'[1] To attempt to reduce human life, however gradually, to the natural scale of animal life, so that the two pictures should stand before us after the manner of Huxley's figures of the two Brains, would be only to extort the exclamation,

[1] Darwin, *Descent of Man*, p. 65.

'Am I a dog?' Nevertheless, so little does the animal represent the inconsistencies, and the evil of men, that we shrink from these with a deeper horror, saying, in our hatred of wrong—

'I had rather be a dog, and bay the moon.'

When these facts are taken together,—seen within some narrow field of observation, giving vividness to the contrast,—it becomes increasingly clear that this question of ancestry

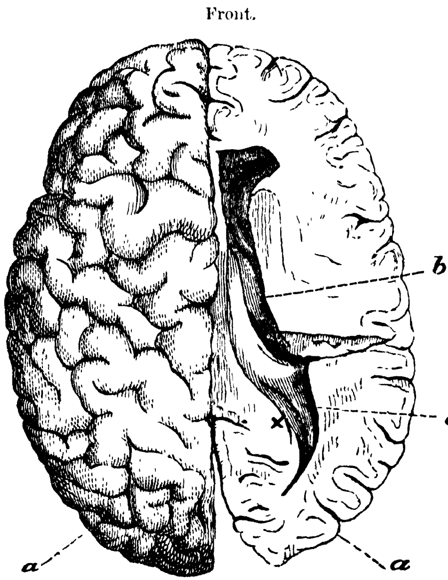

FIG. 24.—Upper view of the left hemisphere, and internal arrangement of right hemisphere of the Brain of Man.

(From Professor Huxley's *Man's Place in Nature.*)

carries us deep into mysteries of natural history, quite beyond range of the scheme of Evolution of Structure.

The conclusion to which my argument is leading will be strengthened in many ways by closer study of the facts. Figures 21 and 22 give the best possible illustrations. These present the brain of the Ape and of Man, *each in its natural size*, both having been exactly measured with the originals. The drawings are made by my son, Mr. W. L. Calderwood,

F.R.S.E., from specimens preserved in the Anatomical Museum of Edinburgh University, and kindly placed at our disposal by my colleague, Sir William Turner. The two things which arrest attention here are the likeness in structure, and the unlikeness in mass.

In the subsequent argument, very much must depend on interpretation of the difference as shown in the size, convolutions, and layers of the nerve-cells within the cortex. We shall be in no danger of false inferences, if we allow to the brain of the ape quality equal to that of man; and, on this assumption, we proceed with comparisons of structure. In comparing the two, I cannot doubt that we see in them

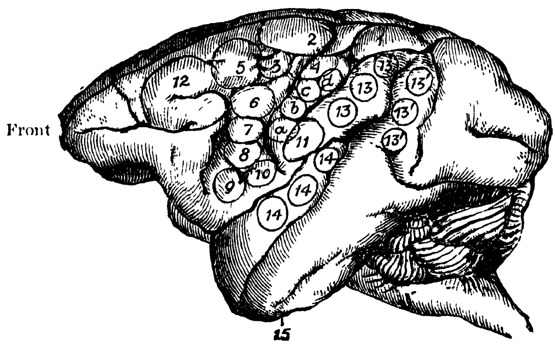

FIG. 25.—Brain of the Monkey, left hemisphere, showing centres of stimulation indicated by Ferrier's experiments.

(From Ferrier's *Functions of the Brain*.

evidence of the action of two distinct laws affecting the development of the organ. On the one hand, we trace the action of the common law of structural Evolution, applicable to both brains alike; on the other, as I think, the action of Mind in the history of Organic Development in man. This I hope to demonstrate as I proceed.

The more fully attention is concentrated on the marked difference here, the more clear does it seem that the superiority of the human brain is due, not alone to the action of cosmic law, but even more to continuous functional activity under the higher demands of an Intelligent Life; development having been extended under laws of heredity. Only by granting application of two quite distinct laws, does

it seem possible to reach a completed account of the contrast which lies before us. The *likeness* sustains the conclusion that in these two brains we see the action of common laws of evolution; the increased mass of Brain in Man speaks of a large increase of activity, which cannot readily be explained without reference to an extended range of functions. Difference of bodily structure, great as it is, does not seem to offer more than a partial contribution towards an explanation. Human Physiology seems to occupy an unpromising position, as long as it judges the Human Brain exclusively under the laws applicable to brains of inferior rank.

Against the enlarged view of the difference here advocated, the criticism of physiologists will be directed with comparative unanimity. Leaning on the structural basis which anatomy supplies, their attention is concentrated on the relation of the Brain to the body, so that brain is regarded as the 'organ of mind' in a quite subordinate sense. Not unnaturally in these circumstances, physiologists are not only very guarded, but quite reluctant to own that there is a whole circle of organic activity which they have failed to record, and which it is even impossible for them to trace. Nevertheless, as it seems to me, evidence is conclusively in favour of the action here of a new power, with addition of which we have a double key to the enlargement of the central organ in Man.[1] As yet, scientific observation does not offer any satisfactory mode of explaining the contrast.

A plea for continuity under the single process applicable to all Brains alike, gives no explanation of our mental activity. The suggestion that our 'Ideas' are 'copies' or 'images' of the external objects with which we come in contact, is now admitted on all hands to be untenable. The physiology of nerve sensibility has exploded this theory, which must now

[1] In comparative Brain structure, there are some outstanding difficulties to be noted, not easily dealt with, and for which as yet a satisfactory interpretation does not seem available. I refer to such cases as the fine Brain of the ox, with the comparatively low Intelligence of the animal; and the beautifully convoluted Brain of the elephant, and the unexampled minuteness of convolution in the Brain of the whale. In *Mind and Brain*, p. 175, I have given a figure of the elephant's brain from the Atlas of Leuret and Gratiolet, and on p. 181 a figure of the brain of the whale from a specimen in possession of Professor Sir William Turner.

be laid aside as antiquated,—an erroneous fancy belonging to an unscientific age. To take Locke's example[1] of a snowball, our idea of it as 'white, cold, and round,' has no resemblance to the qualities in the object. The snowball has not 'the power to produce in us the ideas of white, cold, and round.' The facts in our experience come about in the opposite way,—we have the power, by comparison of snowball with cricket ball, golf ball, and woollen ball, to form a conception of the object, as distinct from other objects in some respects analogous. A single power operating in consciousness accounts for these separate conceptions; not separate powers in the several balls. It is obviously untenable to say, as Hume did, that 'all our ideas, or more feeble perceptions, are copies of our impressions or more lively ones.'[2] This is doubly wrong, for our conceptions of things are not feebler than our perceptions; they are vivid just in proportion as impressions on our sensory are 'lively'; while to make 'copies' of them surpasses the power of Mind, just because our thinking is essentially different from the thing about which we think; because mental processes cannot take effect in physical results. Physiology must decline to walk on the crutches supplied by an antiquated Psychology. It is too late in the day to ask us to follow Hume in saying that 'the most lively thought is still inferior to the dullest sensation.'[3] Mind, in achieving its proper work, is not such a weakling as this would imply.

Let us, then, concentrate on these two Brains, whose respective form and size are exactly depicted in Figs. 21 and 22 (at p. 265), and let us take scientific guidance as to their structure. The form and the convolutions are singularly near in outline, suggestive of homologous functions performed in an inferior organism and in a superior. The contrast may, therefore, well represent two distinct stages in a process of Evolution; the distance between the two is such that allusion to a 'missing link' is natural. Taking each brain separately, it is easy to see how much Physiological science

[1] Locke, *Essay concerning the Human Understanding*, II. i. § 8.

[2] Hume, *Enquiry concerning the Human Understanding*, Sect. ii. § 13.

[3] *Ibid.* § 11.

includes and explains. The muscular arrangements, the nerve ramifications, the localisation of centres of activity within the convolutions of the brain, are all provided for in the germ-cell or egg from which springs in the one case a chimpanzee, in the other a man. Further, we grant in accordance with recent scientific inductions, that the ancestry of bone, muscle, nerve, and brain, can be traced to the cosmic process which has determined the history of all organic life on the earth; and, in saying so, we include all that comes to maturity in the well-formed organism, afterwards yielding to decay, and, sooner or later, to dissolution.

In proportion as this homology is traced, the difference between the two brains is left without adequate interpretation. The features in which these two lives differ are omitted. Physiology has given us satisfactory sense of the completeness of its work, so far as Organic functions are to be included. But there is a singular blank. We are not shown how this larger brain, representing our organic superiority, explains our place in Nature as Rational Beings. No obscurity hangs over the facts of observation. As already shown, Darwin recognises emphatically how large is the significance of the phenomena which illustrate the presence of a rational life on the earth. His words are well chosen. 'No doubt the difference in this respect is enormous, even if we compare the mind of one of the lowest savages, who has no words to express any number higher than four, and who uses hardly any abstract terms for common objects or for the affections, with that of the most highly organised ape.' This enormous difference is not indicated in the contrast between these two brains, marked as this contrast is. Physiology does not attempt to show that it has ascertained that the enormous difference is explained by the functions of the central organ. Granting all that has been established as to structural superiority; as to pyramidal cells in the third and fourth layers of the grey matter; all that has been made out as to localisation of centres in the cortex; all that is known as to disappearance of centres, as for movement of a tail, and appearance of centres for vocalisation, as in the barking of a dog; and, more markedly, in the left hemisphere of the human brain,

as these seem to be connected with our use of speech; Physiology does not hold a strong position when it addresses itself to the task of accounting for the enormous difference between these two lives.

When closely compared, the brain of the ape is seen to be much simpler in structure than the other. It is not merely in mass, but in the complexity of its formation, that the human brain excels the Ape's. But the brain of man is not superior in function, save as the bodily organism of man is in advance of the lower form. On the other hand, when the physiology of the human body is complete, there is no theory of Mind in our possession. Even to begin our observations of mental phenomena, we need to transfer attention from brain to consciousness; and here a whole field of investigation opens before us, within which our sensations and perceptions are but the simplest phases of activity; and 'the stream of consciousness as it flows,' only slightly suggests at any given moment the greatness of human life. If we consider the working of our own Intelligence, it is as strangely intricate in the relations of its constituent features, as is the inner structure of our bodily frame, when skeleton, muscles, and nerve system have been described. Even when we include all effects of taste and smell, of hearing and vision, how slight an account is given of this inner life of ours! We are ever related with the outer world, yet ever severed from it. We do not belong to that outer system, as organism does; the main part of our energy is absorbed with thoughts which have no visibility, and which have only remote relation with the experience of the hour—as remote from passing external occurrences as the traffic on the streets is disconnected with a man's thoughts when these are occupied with things in New Zealand. This intellectual life is not really understood, until it is seen how vital to its activity are our general conceptions, by which we set things and their relations before us in our reflections; how we live in the past, or plan for the future; how we think of our health, and of possible gain; of the benefit of our family, and of the government of society; of the interests of the nation; of the extension of discovery, and of enterprise, and of the literary

activity and scientific discoveries of the age. Of all this procedure, sight and hearing give only the faintest trace of a beginning. These occupations of our minds are so varied, so far-reaching, so dependent at every turn on conditions of thought, not on any organic conditions disclosed by recent discovery, that when we turn to compare again these two Brains, simple and more complex, the Human Brain, superior though it be, appears little fitted to explain what occurs.

A new order of life has come into view, presenting a contrast greater than that which separates vegetable life from animal. In human life we see a wealth of resource, immeasurably transcending the astonishing activity of animals, even when they seem to be anticipating the wants of a life yet to be born. In advance of all life besides, a Rational Life moves in a region, non-existent so far as animal sensibilities and the lower intelligence are concerned,—a region in which is the realm of knowledge, wherein are heights and valleys, and around an ocean of ceaseless movement. Of the grander realities, none save man has a conception, because within his life alone are those 'general conceptions,' which seemed to Socrates the very centre and source of the grand power, moving yet slumbering, in every human soul.

Granting that human organism is the crowning result of long ages of undisturbed action of the cosmic process, the explanation of human life is only a little way advanced. A deeper knowledge is, indeed, secured of the relation of the human structure to the natural history of species; but the higher phases of our life remain unexplained by this deciphering of ancient inscriptions. The increase to our knowledge, which natural history has gathered, is large and full of interest; but, for the most part, it is concerned with animal species. So far as it ultimately comes to throw light on the life of man, that light falls only over a small section of the field of human existence, illumining its lower relations, not the higher, which are unspeakably greater in importance for a just estimate of his life, and for performance of the functions distinctive of man. When this contrast lies clearly within range of our observation, it becomes apparent how slight is the modification on the common view of our life

which Darwinism has introduced to modern thought. That man belongs to the animal kingdom,—that his organic structure is developed from a germ-cell, as is every lower form,—that laws of heredity apply in our family histories, as with lower species,—that bodily development depends largely on environment, and that conditions of health are determined accordingly,—that maturity is reached by slow advance,—that the marks of decay follow closely and surely beyond maturity,—that dissolution of the body comes at length, by laws as fixed as those which provide for development in early life, and that then 'dust mingles with kindred dust'; these, when taken together, are the positions which make up our common conception of the bodily life we share. Darwinism does not, beyond this, touch the wide range of human faculty and of knowledge, patent to all.

In addition to the facts long familiar, we have results recently ascertained of large significance, as that the human embryo passes through stages of development, in course of which the form is undistinguishable from embryonic animal forms; in so much that 'it is very long before the body of the young human being can be readily discriminated from that of the young puppy.'[1] There are, in the human body, marked homologies in structure and function with those of animal organism, 'so that the correspondence of general structure, in the minute structure of the tissues, in chemical composition and in constitution, between man and the higher animals, especially the anthropomorphous apes, is extremely close.'[2] Thus a large accumulation of evidence favours the conclusion that in the human structure we have the crowning result of evolution by the Cosmic Process alone. We now add these conclusions to the information previously at command; but when this addition is made, it has no bearing on the history of the appearance and development of our Rational Life. It throws no light on the origin of the powers of a rational life, possessing a distinct activity. In addition to its knowledge of the physical world, such a life

[1] Huxley, *Man's Place in Nature*, p. 67. For illustrations of embryonic analogies see Romanes, *Darwin and After Darwin*, p. 152.

[2] Darwin, *Descent of Man*, p. 9.

has a world of activity and interest exclusively its own, whose relations cannot even be perceived by the higher mammals, allied to us in structure.

Let us then look at man in his ascertained place in the system of organic life. How does he stand related to other animal species? 'Man in the rudest state in which he now exists is the most dominant animal that has ever appeared on this earth. He has spread more widely than any other highly organised form, and all others have yielded before him. He manifestly owes this immense superiority to his intellectual faculties, to his social habits, which lead him to aid and defend his fellows, and to his corporeal structure.'[1] We credit his corporeal structure to the Cosmic Process: how can we account for the other characteristics? These belong to a new field; they must be credited to an Intellectual Process. The aiding and defending of his fellows are illustrations of another process in Nature, for 'social progress means a checking of the Cosmic Process at every step.' Man fulfils his part in life by that specialty of Intelligence, the appearance of which in the world does not receive any explanation from modification of structure under the Cosmic Process.

We turn to this Human Brain, so wonderfully detailed in its convolutions, and so divided into compartments for distribution of its functions,—its superiority becoming increasingly apparent the longer it is contemplated in contrast with that of the Ape. Guided by the directions of the fissures, we see in outline the four grand lobes, to which we add the insula concealed beneath. We further add our interpretations of the functions of this organ by reference to the localisation of functions, verified through electric excitation. We are thus impressed by the great superiority of the organ, and also of the bodily structure of man. But a new question arises. If an Intellectual Process has started later in history; if it has been continuous in the life of man, and in no other life but his, is there any visible effect of this process on the Human Brain? If there be, it can be only because the Intellectual Process

[1] Darwin, *Descent of Man*, p. 48.

tells on the government of his conduct, and on the regulation of society. The features of this Intellectual Process within the consciousness of man appear in the regulation of his own life, as it is moved by impulses and instincts, such guidance resulting in the formation of character, by cultivation of virtues. The results come out, still further, in all those forms of social order and government previously described, when common interests are promoted and secured. We have now gained the standpoint whence the relations of inner and outer are seen in advanced order. The physical life itself is rationalised, by being moralised, by reason of its union with a higher life, dominant in social life, as man has already proved himself 'the most dominant animal.' But, being more than an animal, he is at once ruler and subject in an ethical world, within which the Intellectual Process works out its history. 'Brain is the organ of Mind.' So we all say, and are always saying. Has this Intellectual Process, operating throughout the long ages of human history, had no effect in development of the Human Brain? Is such a thing conceivable? Knowing what we do, as to slight modifications of structure under natural law, can any one believe, or ask others to believe, that through these thousands of years in which Mind-action and Brain-action have been operating in unison, no result whatever has appeared in the history of brain development? Such a belief is no longer possible. 'As the various mental faculties gradually developed themselves, the brain would almost certainly become larger.'[1] The action of thought must carry with it the physical realisation of its own conclusions and purpose; must show its dominance in the whole life as the regulating power; must control human conduct in order that life may be truly moral; must ultimately govern Society, bringing men to own common rights and interests. The Brain is the bridge by which all this traffic of thought must pass to the outer fields of industry and social fellowship, as surely as the nerves of the correlated hemispheres of the Brain pass by the 'bridge' to the opposite side of the body. If we hold to the unity of our life, while believing in an Intellec-

[1] Darwin, *Descent of Man*, p. 54.

tual Process, we must hold, as one of the inductions which modern science imposes upon us, that the Human Brain has through all the ages been gaining by use; developed under the enlarged functional activity assigned to it in its alliance with Mind,—an alliance which has added to its functional activity all that is physically involved in moral government. Turning again to these two brains, let us say if it be not certain that the superiority of the Human Brain is largely due to those ages of activity through which the Intellectual Process has been telling on this nerve-centre, which is the organ of Mind,—a process the effects of which have not been shared by the ape's brain.

When the long course of human history is considered, it seems legitimate ground of surprise that the two brains are as like as they are. Under the comparison of the ape's life as a whole, with human life as a whole, there is, however, ample explanation of the difference. We thus understand how it happens that men of intellectual power and industry have been found possessed of brains relatively heavier than the normal organ, as we read with interest of the unusual weight of brain of Cuvier and Abercrombie, of Goodsir and Spurzheim, of Dirichlet and Simpson, of Morny and Webster, of Campbell and Agassiz, of Chalmers and Fuchs.[1] If we consider mass and weight, we can see how much the Intellectual Process—in some respects distinct from the ethical process (a distinction which a scientific age readily recognises)—tends to develop Brain. If we pass from highly specialised lives, to the common conditions of life, which more exclusively illustrate the Ethical Process, we have a wonderful testimony for neural development in the single fact that the Ape's brain, including the gorilla, with the chimpanzee, at its *maximum* weight is only 15 ounces, whereas the brain of man at its *average* weight is 49 ounces.[2]

After this contrast in weight, arises the question as to the likeness of these two brains in *form*, in the arrangements of lobes, and in the convolutions belonging to each lobe. Here

[1] The details in these cases I have given in *Relations of Mind and Brain*, p. 23.

[2] Rolleston, *Scientific Papers*, pp. 49, 50.

we part company with Darwin, to consider the advance in our knowledge of brain structure which has rewarded the research of specialists. This investigation dates from the publication of Gratiolet's *Mémoire sur les Plis Cérébraux de l'Homme et des Prematès*, 1854, with Atlas showing comparative structure of brains. It passes onwards to the beginning of experiments in localisation in 1870 by Fritsch and Hitzig, and the strikingly successful work of Ferrier in his *Functions of the Brain*, 1873; followed up by continued research, which has placed the localisation of functions in the cortex amongst definitely ascertained results. We have further more particularly to consider recent investigations as to the comparative structure of the Ape's brain and Man's. Of these, the most important published in our country are Dr. Cunningham's *Contribution to the Surface Anatomy of the Cerebral Hemispheres*, with Dr. Horsley's *Chapter on Cranio-Cerebral Topography*, 1892, and Dr. Benham's *Description of the Cerebral Convolutions of the Chimpanzee*, 1894.

The two drawings I have introduced (p. 265), showing the brains of the Ape and Man in their natural size, enable us to institute comparisons of these two organs without readjustment of scale required, when the Human Brain is given on a reduced scale, or the Ape's Brain on an enlarged scale. When these two figures are compared, it will appear that the Ape's brain is a simpler organ, but very closely allied, built up on the same model as man's, and so like in structure, that the approximation becomes striking. The resemblance here shown is quite borne out by all the examples of the Ape's brain in our Museums, many of which have been figured in the large number of Memoirs now published.[1] The two illustrations I have given may be compared with the two figures prepared by Huxley, introduced on p. 266 and p. 267. These present the upper or dorsal view of the organs, and show at the same time a portion of the inner structure, by exposing the ventricle or cavity in the centre of the organ; and indicate, also, how the grey matter runs in upon the white matter. The Cunningham

[1] A list of sixteen important Memoirs on the Brain of the Chimpanzee and Orang is given in Dr. Benham's paper, specially referred to hereafter.

Memoirs, already referred to, are of great value, the carefully-executed plates enabling the reader to judge of the development of the brain within the embryological period and during childhood. Special interest belongs also to Dr. Benham's *Memoir* of results in his examination of the brain of an Ape, named 'Sally,' which lived for eight years under observation in the London Zoological Garden.[1] With this paper are given 46 figures, which help greatly in overcoming the difficulties connected with comparison of a large variety of examples, including brains of monkeys as well as of apes. Dr. Benham gives three leading types of brain: Fig. 26, Brain of Chimpanzee, in Oxford University Museum; Fig. 27, 'Sally's' Brain; Fig. 29, Brain of a Hottentot Bushwoman. The last named is on a reduced scale, according to the method commonly adopted. The five figures on Plate VIII. of Dr. Cunningham's *Memoir*, taken with the four figures, which I give below, with forty-one more, showing structural varieties, prove the close resemblance of the Simian and the Human Brains.

With these illustrations, additional interest attaches to Rolleston's observation that 'the cerebral hemispheres of the Hottentot's brain are seen to project farther beyond the cerebellum than do the cerebral hemispheres of the white man's brain.'[2] The value of Dr. Benham's paper is the greater on account of 'Sally' being 'the oldest chimpanzee whose brain has been described' (1894); and the brain 'the largest that has been carefully measured.'[3] Plate I. in the Cunningham *Memoir* will be found of the first importance, showing the development of the Human Brain from the first week of growth to the period of birth. (33 figures.)

The figures I give (p. 265) of adult brains showing the respective Brains in their natural size, after having been carefully measured, were examined by Professor Sir William Turner. If these are compared with Huxley's figures given on p. 266 and p. 267, and with Dr. Cunningham's, next with

[1] *Quarterly Journal of Microscopical Science*, vol. xxxvii., new series, p. 47.

[2] Rolleston's *Scientific Papers and Addresses*, p. 32,—'On the affinities and differences between the brain of man and the brains of certain animals'

[3] *Journal*, p. 52.

Dr. Benham's, the resemblance of the two organs will be placed beyond doubt, and the importance of this likeness will be at once admitted. With such evidence before us, it will be readily understood how it came to pass that this similarity of structure produced a deep impression on scientific observers when first discovered, and afterwards on the public mind, when Huxley made the facts commonly known by publication of *Man's Place in Nature.*

The significance of this structural resemblance is the chief concern now. The support it affords to Darwin's theory of organic evolution is obvious, and I have already given full effect to this testimony. The main question is,—How far does the resemblance throw light on the relation of Brain structure to Mental activity? The first and most direct conclusion is obvious, and of great importance for the present discussion; the Brain of the Ape is much more closely allied to the Human Brain than the Simian life approximates to the Human. While the brains are strikingly alike, the lives are so separated that the lower has no fellowship with the higher. So long, therefore, as the comparison is between Brain and Body, the resemblance is easily understood, for Ape and Man closely resemble each other in configuration and in muscular action. But when attention is turned to the relations of Brain and Mind, the difference between ape and man, in mental activity, is so great, that the resemblance in brain greatly lessens the force of the suggestion that Brain structure supplies the key to the Intellectual superiority of man. The human brain is, indeed, at once much greater in height, and more complex in structure than the other. But this superiority is largely accounted for, in the first instance, on Anatomical and Physiological grounds. We have only to consider the illustrations of the superiority of the human organism to be satisfied of this. Consider the largely extended variety of *physical* action in the life of man, and it will appear that the difference in brain is largely explained. There is a great amount of human work in which our Simian congeners have no part, such as the variety of manipulation; our vastly extended use of the organs of special sense, more

particularly of sight and hearing; our constant application of language; our continued resort to writing and reading. Professor Cunningham, in referring to the reduced size of the occipital lobe in man, and the large relative size of the parietal, naturally suggests it as matter for consideration 'whether this parietal increase in the human brain has anything to do with the acquisition of the educated movements of the limbs, more especially of the upper limbs, and that wonderful harmony of action which exists between the brain and the hands, and which has played so important a part in the development of the species.'[1] Though we here touch the border-land where appears the relations of brain to mind, these data belong to the sphere of the physical. No doubt there are further to be considered, great differences between individuals in the exercise of their powers of manipulation and of speech; but so are there marked differences in the development of human brains, *consequent on mental activity.* If reference be made to the list of names I have given (p. 277) of those who have had Brains of more than ordinary weight, it will be found that the majority of them were conspicuously men of action, as well as men of thought, —commonly men engaged in a busy professional life. If such evidence be added, Mind being presupposed as an active *agent* in development of the organ, along with the larger amount of sensory and muscular activity in man's life, the superiority of the Human Brain is explained, while the genesis of Mind remains unexplained.

When we pass to the *internal structure* of these organs, our conclusion as to close resemblance is strengthened. The fissures which subdivide the mass of each hemisphere are strikingly alike; similar lobes are present in each organ; the convolutions of the several lobes are laid out on the same general plan. The contrast is that between a simpler and more complex structure, on the same model. The primary convolutions and the great typical lines and ridges are the same in the Brains of the Apes and of Men. The advance visible in the Human Brain is symmetrical, showing continuity of organic life as the brain grows from the cerebral

[1] Cunningham, *Memoirs*, p. 59.

rudiment. The different stages of this growth during the early weeks of embryonic life are shown in Professor Cunningham's figures on Plate I. of the *Memoirs*. From a careful series of observations, it appears that growth begins from the floor and from the roof of the intra-cranial stem; in the one case, the basal ganglion, known as the *corpus striatum*, the massing of motor nerves, 'rises as an elevation on the floor';[1] in the other, the fissures of the cortex are 'the result of a series of deep infoldings of the thin cerebral wall,'

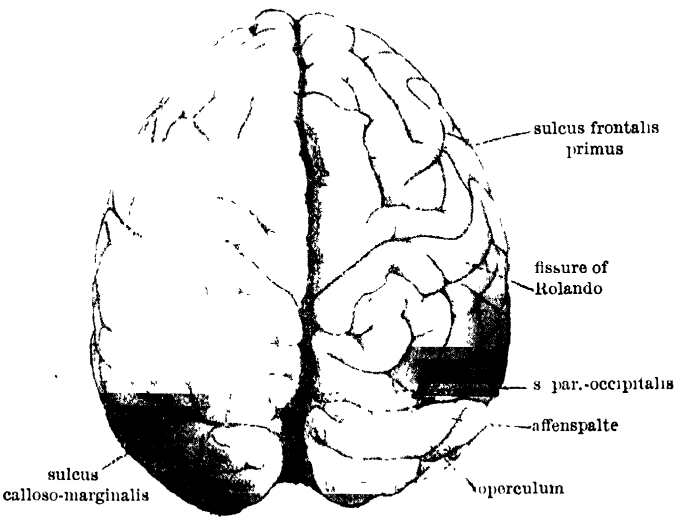

FIG. 26.—Brain of Chimpanzee (Oxford Museum).
(*From a photograph, reduced*)

constituting 'shelf-like projections into the cavity of the primitive lateral ventricle.'[2] The elevation of the floor produces the fossa for the first grand fissure, the Sylvian; afterwards, the additional leading fissure, Rolando, marks the stages of progress in development of the cerebral lobes.

If we penetrate to the centre of the organ in Ape and Man, we find the internal cavities or ventricles indicating the position of the original stem or cerebral rudiment. This is shown in Huxley's figures (p. 266 and p. 267). Within the

[1] Cunningham, *Memoirs*, p. 2. [2] *Ibid.* p. 1.

brain of the dog a similar arrangement is not found. Thus, beginning observation with the 'intra-cranial nerve-stem,' as Rolleston phrases it, or 'cerebral rudiment,' as Balfour prefers to say,[1] the foundations are the same, so that contrasts measure the advance reached in the two cases.

If, on this level, we diverge to glance at the Cerebellum, or little brain, generally understood to be largely concerned with equilibrium in bodily movement, Rolleston has remarked

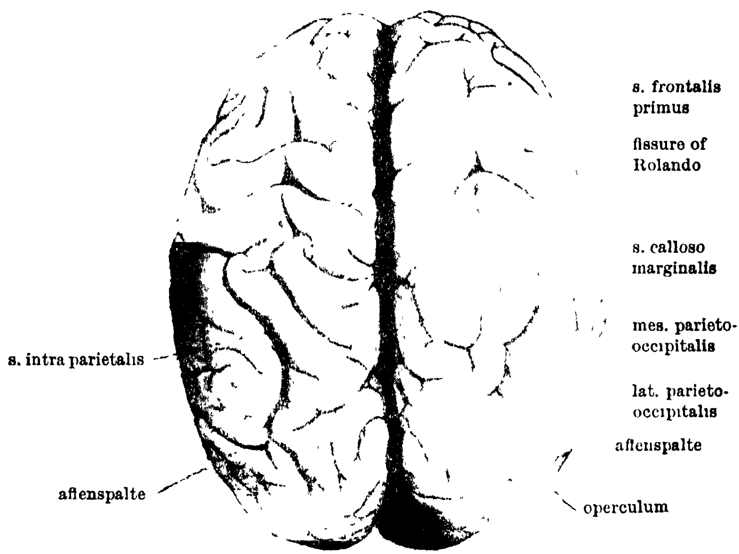

FIG. 27.—Brain of 'Sally.'
(From a photograph, reduced.)

that in the largest of the apes, 'the cerebellum is much larger, and especially is it much wider, in relation to the cerebral hemispheres than it is in man.' This is in accordance with the habits of the animal, a large amount of its activity being concerned with maintaining its equilibrium, as it moves from branch to branch among the trees. This supplies a well-defined example of the relation of the central structure to

[1] Balfour, *Comparative Embryology*, p. 17 and p. 360.
[2] Rolleston, *Scientific Papers*, p. 33,—'Affinities and Differences,' etc.

physical activity, giving superiority of brain structure to the animal, at a place where its physical superiority is admitted.

Returning thence to the chief organ, the Cerebrum itself, and returning to the intra-cranial nerve-stem, we see the point of growth, whence the grey matter of the Brain is developed, and laid up in convolutions within the cranial cavity. From this point, it is obvious that the contrast of the two brains is a quantitative one, so that it seems as if the inferior brain were only stopped in its growth, while the Human Brain is the continued growth, reaching a fuller development on the lines on which both had started. We

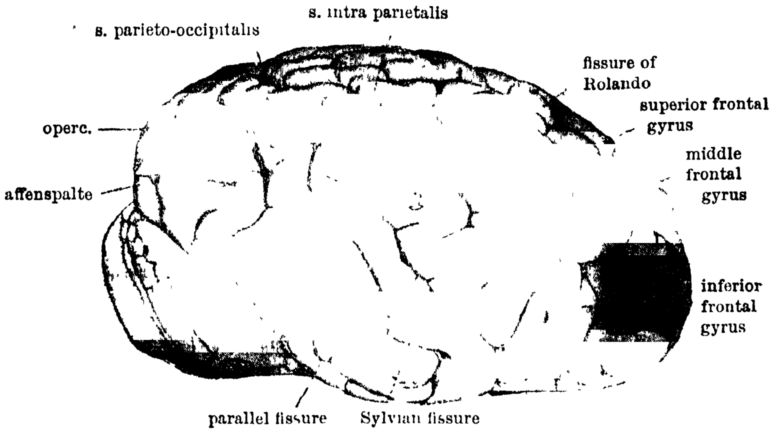

FIG. 28.—'Sally': side view of Brain.
(From a photograph)

see a *common* development in the two, surpassed by a *special* advance in the higher, the history of advance being shown in the fuller convolutions of all the lobes. Whether observation concentrates on the Body, or on the Brain, in these two species, Physiological results keep pace with Anatomical advance.

Next, we proceed to compare different regions of these Brains. The greater height and fulness of the frontal lobes is apparent by reference to the two figures (p. 265), showing the natural size of the organs. This will be confirmed by reference to the Atlas of Gratiolet, the figures in Professor Cunningham's *Memoirs*, and those in Dr. Benham's paper.

We may say that the 'efflorescence' of the organ is more ample and detailed. Marshall points out[1] that the brain of the chimpanzee is most strikingly inferior to the human brain in its altitude; and this is at once manifest in the frontal and parietal regions. There are three obvious stages of advance. The brain of the Monkey is pinched in form, as if the growth had extended only in a slight degree towards the frontal region, while the growth to the rear is fuller. The

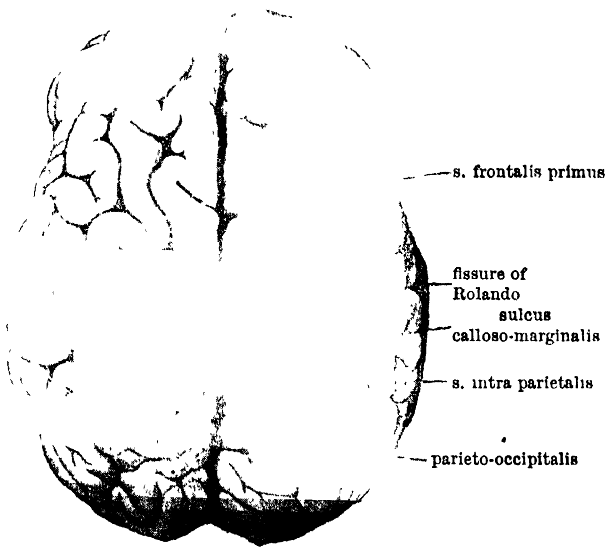

FIG. 29.—Brain of Hottentot Bushwoman.
(From a photograph of Gratiolet's Figure, reduced.)

Ape's brain is in the frontal region much fuller than that of the monkey, being a well-filled-up miniature of the human brain, and presenting a first stage of its growth. In the Human Brain the full growth is seen, represented in the more complex foldings of the convolutions in all the lobes except the occipital, for this is somewhat reduced in the human brain. Thus we have before our view three different stages of growth of the same organ. The similarity in plan, and the difference in the stages of advance, will be more

[1] *Natural History Review*, July 1861.

readily appreciated by introduction of the figure of the Monkey's brain (Fig. 30).

We are clearly following the lead of the structural growth in recording these contrasts. Taking the three together as illustrating continuity, we have a visible representation of the history of the natural growth of the organ. The advance towards the rear in the ape's brain is thus remarked upon by Cunningham: 'When the primate head reaches in its development the quadruped stage, the cerebrum goes on, without any intermission in its growth, towards the higher development and the formation of a distinct occipital lobe.'[1]

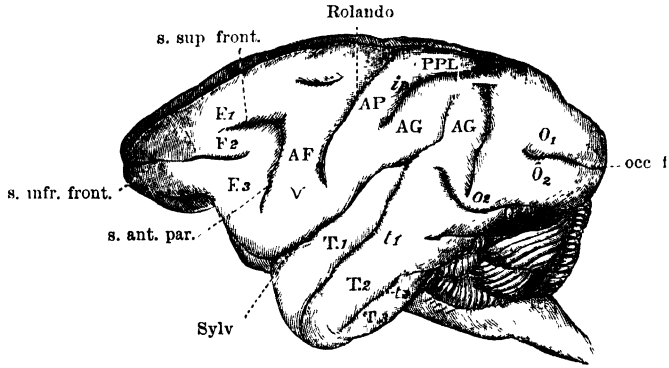

FIG. 30.—Brain of the Monkey—left hemisphere (*natural size*).
(*From* Ferrier's *Functions of the Brain*)

While these relations and contrasts are being marked, it is needful to remember that, in accordance with the analogy of Nature, there are considerable varieties in the development of Human Brains; and that even in the same life, the two hemispheres, so far distinct organs, have their own distinct development, so that the left has its distinguishing features when compared with the right. With these variations, consequent on the manner in which certain convolutions are thrown out, it is desirable to connect the observation that while 'men differ greatly as to the length of their brains, they differ little as to the height of them.'[2]

[1] Cunningham, *Memoir*, p. 30.
[2] Rolleston, *Scientific Papers*, p. 35,—'Affinities and Differences.'

We have before us three species of life, showing distinct types of brain. When these brains are contemplated as illustrations of comparative structure, they show three stages of advance in continuity of plan, warranting the inference of continuity in Life.

This inference is strengthened by continued research into the structure of the brains of the Chimpanzee, Orang, and Gorilla. Dr. Benham's figure of 'Sally's brain' contributes in an important measure toward solution of questions which had been keenly debated as to specific differences. These were concentrated on the rear of the brain, as the occipital region is more fully developed in the Ape, and its convolutions are laid up in a manner apparently different from that followed in the human brain. These remarks applied to the portion distinguished as the 'operculum,' and to the aspect of the parieto-occipital fissure. Conclusions as to these points are simplified by reference to the figures given in Dr. Cunningham's *Memoir*, and to 'Sally's brain,' as given in Dr. Benham's. The latest example shows the occipital region more filled up, so that the continuity of the convolutions is more apparent.[1] In this example there is a 'more furrowed brain than in the ordinary chimpanzee.'[2] 'In "Sally" this operculum is practically absent, and the sub-opercular groove, or "Affenspalte" is fully exposed.'[3] Thus the resemblance in structure is found to be still closer than had been previously supposed.

We are following as exactly as is possible the lines of evidence now at command, if we represent three stages of evolution in the Brain. These come from a common starting-point, and follow on the same lines, giving earlier, later, and most advanced forms. In 'the cerebral rudiment,' the 'floor' gives rise to the ganglia at the base of the hemisphere, corpora striata, etc.; the 'roof' gives rise 'to the hemi-

[1] Compare figures 10 and 11, accompanying Benham's paper, with the shaded figure.

[2] Compare Cunningham, 'Contribution to the Surface Anatomy of the Cerebral Hemispheres,' *Royal Irish Academy*, vol. vii. (1892), with Benham's paper, 1894.

[3] *Microscopic Journal*, vol. xxxvii. p. 75 (1894).

spheres.'[1] 'The first change that takes place consists in the roof growing out into two lobes, between which a shallow median constriction makes its appearance.' From this 'intra-cranial nerve-stem' the brain of the Monkey is thrown up, showing its greatest dimension in the centre of the organ, the frontal and occipital regions being less developed, reaching in both parts only a pointed form. The brain of the Ape, beginning in the same manner, proceeds beyond the monkey's, by a fuller development of the frontal and occipital regions, and, keeping pace with this, there is all over the cortex a larger folding up of the convolutions. Starting from a like stem, and moving by a similar course, the Human Brain passes still farther beyond the ape's than the ape's had gone in advance of the monkey's brain. The result is the fully developed organ which appears in the bushwoman, or in the more elaborate organ of a celebrated mathematician, such as I have given on p. 119. A close examination of these two brains will also show, that the difference between the uneducated and the highly educated person, separating the lowest savage from a gifted representative of our modern civilisation, so far as brain structure *can* illustrate this difference, consists in a more elaborate development of the convolutions.

From these accumulated results of the more recent observations, it is apparent that the closeness of resemblance between the Brain of the ape and that of man is against the earlier hypothesis that the superiority in Intellectual Power distinguishing man can be explained by Brain structure. Darwin has stated the contrast of Intelligence in the two cases, as 'an enormous difference,' 'even if we compare the mind of one of the lowest savages,' 'with that of the most highly organised ape.'[2] Morphological differences in the Brain of the monkey, ape, and man, show gradual accumulation of the common grey matter, folded up with increasing complexity, as expansion of the organ is effected The larger Brain of man is a larger accumulation of cellular tissue. Comparisons must, therefore, be next transferred to

[1] Balfour, *Comparative Embryology*, p. 360.
[2] Darwin, *Descent of Man*, p. 65.

the comparative internal structure of this tissue; and more particularly to the differences appearing among the Nerve Cells, supplying nerve energy to the several parts of the Organism, and sustaining vital relations with them. The question now is this,—Can any difference in the nerve cells account for the Intellectual difference which stands unexplained? A reference to Fig. 17, p. 123, will show the appearance of a section of the grey matter of the Human Brain belonging to the third and fourth layers of the superior frontal convolution. The structure is magnified sufficiently to make it possible to distinguish the larger and smaller cells, as they are imbedded in the neuroglia, with its corpuscles. To the large 'pyramidal' or 'multipolar' cells, thinkers of the school of which Haeckel is a conspicuous leader, continually make reference, as a probable explanation of our Intellectual superiority. The value of this hypothesis is the chief thing to be considered now. Careful examination of the Figure referred to will supply guidance towards a conclusion. The structure of nerve cells is in all cases the same, and their functions are the same, in so far as all of them are cells placed in vital relation with sensory and motor nerves. It is not found that there is anywhere in the central organ a breach or deviation in the system of brain structure, as would be the case if some of the tissue, let us suppose in the frontal lobe, or perhaps in the third or fourth layers within this lobe, were separated from vital relation with the nerve system, common to all other nerve cells. Any such separation would greatly help Haeckel's hypothesis; but this support is wanting. Indeed, all the conditions of the problem, specially those connected with evolution of Organism, go against the fancy that we shall find it possible to segregate 'mind cells,' inasmuch as all the *external evidence* of the action of Mind in human life is drawn from the action either of sensory or of muscular apparatus. The evidence for our Intellectual superiority is constantly being presented in the use we make of our senses and muscles. When this is considered, the conception of the severance of a proportion of great cells from bodily relations is seriously discredited. This impression is

confirmed by reference to the distribution of the functions of the human body. We trace, with more or less precision, in the lower parts of the central system, a well-defined line of severance between the fields of physical and mental activity. Here Haeckel might well expect to gather evidence in support of his contention; and here again the evidence fails. By comparing the spinal cord and medulla, with the Brain proper, we separate a *reflex* physical activity, from *voluntary* use of our sensory and motor apparatus. The distinctness of the subordinate nerve-centres helps us here. So long as observation is restricted to an area lower than the Bridge, we have reflexes in which Mind has no part. Accordingly, the cells belonging to the spinal cord and to the medulla are largely connected with bodily functions, which have no relation with Mind. If no large-sized cells exist in this inferior region, we should be warranted in assigning a probable value to Haeckel's hypothesis. But, within the scope of purely physical activity, there is a deal of hard work accomplished, rendering it improbable that the cells charged for such work can be insignificant in structure. This is confirmed when we observe the provision made in the supply of grey matter within the spinal column for the spinal nerves. The figure now given will illustrate. (Fig. 31.)

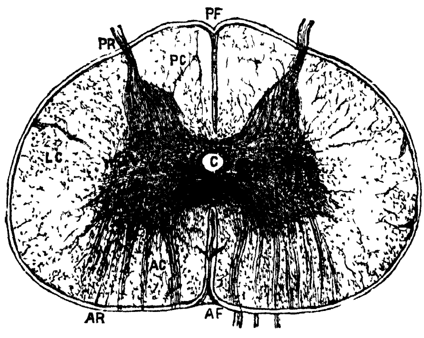

FIG. 31.—Section of the Spinal Cord, showing the relation of the white and grey matter.

(*From* Turner's *Anatomy*.)

The cellular tissue within the spinal cord is more abundant at some places than at others. It is gathered near to the outgoing nerves, in readiness for its work, spreading out its mass to meet the requirements of the spinal nerves. When this soft mass is lifted from its position and placed under the microscope, it is not filled with small cells distinguishable from those in the Brain, where

voluntary activity is originated. Among the cells placed near the vertebræ, there are multipolar nerve cells in plenty. We must, therefore, lay aside the fancy that muscular work is slight work for the nerve cells. The opposite is obviously the case; multipolar cells are in constant use for execution of reflex actions: on this account the hypothesis must be abandoned that 'pyramidal' cells are 'mind cells.' If it seem needful to go wider afield, into other regions of comparative structure, our conclusion is confirmed. Haeckel has supplied suitable illustration, presenting a figure of 'a large-branched nerve cell, or "mind cell," from the brain of an electric fish (torpedo).'[1] Unless there is some effort to show that special Intelligence belongs to this fish, the observation is adverse to the theory which Haeckel intended to uphold. In view of experiments for localisation of functions by electric excitation, it is interesting to have observation directed on the electric fish. But there can be nothing helpful to the argument in a claim to Intelligence in behalf of an animal of this low order. If the evidence for 'Animal Intelligence' is restricted to the life action of the higher mammals, as it is now generally admitted to be, the large-branched nerve cell in the Brain of the electric fish becomes a striking testimony against Haeckel's hypothesis. The assumption must be abandoned, that distribution of work, physical and intellectual, can be attempted by reference to the large multipolar cells, or that we have evidence to favour the hypothesis that 'mind cells' can be separated from 'nerve cells.' Here we reach the last lines of defence for the claims of Physiology to supply a scientific theory of the evolution of the Rational Power of man, or of the appearance of such power in history. The triumphs of physiological research are admitted; the additions to our knowledge thereby are many, and are of very great value. But when even combined contributions are laid together, anatomical, histological, and physiological, Science offers nothing in the shape of a reasonable theory of the appearance of Mind. At every point to which observation has been turned, we have gathered contribution towards a

[1] Haeckel, *Evolution of Man*, translation, vol. i. p. 128.

cumulative proof that Mind in man is not the product of organic Evolution.

Further, it appears, in accordance with the laws of development connected with use of the organ, that the action of Mind has helped largely in development of Brain. There is continually a voluntary direction of its activity for ends which only a rational agent can contemplate and execute. This addition lifts out of the way the only remaining obstacle to the completion of the scheme of historic advance. Notwithstanding the resemblance of the ape's brain and man's, the difference between them is very great. (Figs. 21 and 22.)

Much interest attaches to the important discovery of fossil remains in the island of Java, made by Dr. Dubois [1] in 1891, which have now been exhibited before various gatherings of scientific experts. The first discovery of teeth and bones could not in itself be taken as conclusive proof that a new species had been traced; but when the cranium was discovered in 1892, the problem of an intermediate form between the Ape and Man had been unquestionably raised. The skull, exhibited by Dr. Dubois, at the invitation of Sir William Turner, in the Anatomical Class-room of Edinburgh University, in November 1895, is, I think, reasonably claimed to be a nearer approach to the skull of a 'missing link' than anything previously discovered. If the thigh bone, exhibited at the same time, belongs to the same skeleton, and is not human, there is reason to grant that the animal was a land-walker, not an arboreal climber; and, in that case, Dr. Dubois has reason to claim the discovery of an intermediary species, which, after Haeckel, he names *Pithecanthropus erectus*. The question remains in suspense whether the skull is human, or intermediate between Ape and Man.

The evidence on which the history of Organism and the history of Mind must be held distinct has now been placed in view. On the acknowledgment of this distinction must

[1] Eugene Dubois, *Pithecanthropus erectus, eine Menschaenliche Uebergangsform aus Java.* Batavia, 1894.

Summary in *Nature*, Jan. 24th, 1895, p. 291.

Criticism by Dr. D. J. Cunningham, Dublin: *Nature*, Feb. 28th, 1895, p. 428.

Criticism by Sir William Turner, *Jour. Anat. and Physiol.*, vol. xxix. p. 424.

next hang our treatment of the relation of the two, through Brain as the Central Organ for regulation of all bodily activity, sensory and motor.

When we consider that 'brain is the organ of mind'; when we contemplate Mind as originating a large part of our physical activity; it becomes intelligible how the Human Brain has been developed quite beyond the advance which ordinary nerve action would suggest. Its history has not been determined exclusively by the action of the laws of Evolution, for its action has been regulated greatly by Mind, which must be presupposed. Through long ages of human effort, the hereditary gain must have been steadily increasing. The evolution of Brain as represented in the successive stages of the monkey, the ape, and man, has proceeded in accordance with the history of evolution in the lower order of vertebrates. These three higher stages, in so far as they illustrate continuity of organic life, are accounted for by the Cosmic Process which has had constant application to animal life. The marked superiority of the Human Brain arises in part from the erect posture, with disuse of the fore-limbs for locomotion, and their application to industrial effort; in part from use of the organ for fulfilment of rational purpose. Intellectual activity, unexplained by organic functions, has given a new development to human organism, making Brain the organ of Mind, and effecting a combination of forces, physical and intellectual, found nowhere else in Nature.

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CHAPTER XVII

COSMIC PROBLEMS

AFTER having considered man as a thinker,—the exclusive possessor of Rational Life,—it is natural that I should close with a brief study of the outstanding cosmic problems which have in all ages engaged the thoughts of men. These are the problems which concern the cosmos as a whole, the origin of things, the government of the world as it appears to our race, the relation of the cosmic process to the ethical process, and our destiny as intelligent beings in view of the obligations resting on us, and of the responsibilities we carry with us increasingly as our life advances, until death comes, and we vanish from the place which for a brief season has been the field of our activity. With less or more of intellectual grasp, but always feeling the mystery of things, men have in all ages been occupied with these great questions. Modern thought meets them with all the advantages derived from a great accession of knowledge.

Never in any age has the light of science shone as now; and we desire to have it indicated with some approach to precision how these grand problems of existence are presented now, and more particularly how they have appeared to scientific leaders, who have had a conspicuous part in guiding the thought of our age.

The special purpose of the present argument has been to show how Man is related to the lower animals, as he is united to them in organism, yet separated from them, as belonging to a distinct order. My object now will be to consider briefly man's relation to the cosmic system as a grand unity, governed by fixed laws, and, in a variety of ways, manifesting the action of persistent forces.

That human thought has passed through a period of

special discipline by its entrance on a scientific age is fully recognised. That it has, on the one hand, accepted important modifications, and that, on the other, it has been greatly enlarged in range, we all know. That our speculative thought and our religious beliefs, as well as our industrial and social organisations, have received the impress of a new order of things, there is abundant evidence to show. These changes being matter of common observation, we desire to ascertain what are the general results, and what is the promise of our age. This inquiry has at once an historic and a practical interest, for, as we have seen, the *common thought* of the times must determine the progress of the race. The conceptions, the beliefs, the expectations of the age, must not only form the experience of the passing generation, but must largely decide the future to be unfolded, and to affect generations unborn. We seek to inquire with what results, intellectual, moral, and religious, the change has been effected, in so far as such results appear in our social life, in our intellectual tendencies, and in our religious beliefs.

The conclusion most readily reached, as to which the largest amount of agreement can be secured, is the increased sense of freedom arising from the expansion of knowledge. The significance of this is greater than is even yet quite manifest. It is not merely that there has been a gradual transition from a period when 'authority' was a dominant force,—a transition leading our race to exercise greater liberty of thought and action; but even more largely is it true, that the whole race, so far as it is as yet capable of being affected by the progress of Science, has been brought into closer relation with Nature, feeling itself a part of the general system of the cosmos, and carrying with it an assured understanding of the history of events through means of which the world has come to be the orderly system now recognised. If knowledge is power, its most assured result is freedom; and the outcome of a rational use of such freedom must be, general improvement in the conditions of human life. Transitions, however, always imply risks; commonly they leave traces of the fracture and disintegration of an earlier order of things.

Only rarely do great advances occur without commotion to the antecedent condition. This common result has followed the increase of our knowledge of Nature, leading to the recognition of persistent cosmic processes, traced through a physical order, and through an ethical order.

There is, however, little chance of an optimistic view of things gaining general acceptance,—for there is no finality visible between us and the horizon,—no apparent resting-place where struggle and conflict shall have come to an end. With the better understanding of the order in Nature which science has brought home to us, we have learned the great truth, that struggle is the condition of progress. This is the fundamental lesson which will live in the thoughts of men, though increase of material advantages, along with 'saving of labour,' may bring upon us the dangers of ease and self-indulgence, foreshadowing loss of muscular and neural vigour. The old prophet of a past generation, who never wearied in preaching his doctrine of 'the dignity of work,'[1] has even now fresh testimony to the wisdom of his teaching, and this from quarters whence he would least have looked for it, and in an age when the spirit of self-indulgence would have vexed his stern and rugged nature. The cosmic processes ever work for the victory of brave struggle, sometimes waged through blind impulse, and sometimes through understanding of the fixed conditions to be reckoned with, if individuals and nations are to make way. All men are coming to recognise this truth with some degree of appreciation. Whatever temptation there may be, for a time, to think of the 'saving of labour,' even more than of the value of persistent effort, the cosmic process is master, and it will bring us again to a due estimate of endurance, bracing us for conflict with untoward conditions. As of yore, so it will be still, the victory will be to the strong; general advance will be gained by forces not to be driven from the field, not to be bought off by accumulated treasure.

Most serious amongst the consequences of the revolution of thought, which science has brought about, threatening direst evil, is the unsettling of religious belief which has

[1] Carlyle, *Past and Present*.

occurred. The more closely we examine *immediate* results, the more discouraging will be our estimate of their character. If our attention is concentrated on past times, which seem to have been better than these, and averted from the future which is to produce the harvest to be gathered, there must be misgiving; but this apprehension cannot escape giving token of its weakness, in distrust of the Cosmic process, and also of the Ethical, and even of God, reigning in the world, and in whose reign our race has its abiding security. A pessimistic view can no more find acceptance among men than an optimistic. It cannot be denied that changes in opinion, and consequently in our modes of life, have taken such a direction as to awaken concern; and those who have been most disturbed by the immediate effects are not the least thoughtful men of the times. Nevertheless it should be remembered that any change revolutionising the thought of the past must awaken concern within the generation over which it passes. But this fact remains, that discovery is clear gain;—increased knowledge brings enlarged experience, and also leads us into closer contact with the conditions under which life's battle is to be fought.

This scientific age has its Agnosticism, for the spirit of scepticism is abroad; and so, for a season, it must be, since criticism belongs to the strength of thought, which must have scope in sight of a new revelation. In the criticism fearlessly developed, there is a sense of the vigour of youth, for the race does not grow senile. With fresh discovery, there has come a renewal of energy. It is not a reproduction of primitive thought; it is a further remove from it; yet is it not a separation from it, but only an advanced stage in its evolution; for no generation has appeared in which the historic spirit has been in stronger form, showing higher regard to what was 'primitive,' or setting greater value on 'the heritage of the ages.' But the feeling which is stirring, and giving constant proof of its vigour, is certainly not a repetition of the primitive, not a rejuvenescence, but a sense of the freshness of an advanced intellectual age, roused to enlarged consciousness of its power, by vast discovery of truth.

But the Agnosticism of our age bears within itself a manifest sense of its own limitation, and so has within it the hope of a greater future, from which we cannot be far removed. It is the mission of Doubt to prepare the way for a larger Faith. Mountains are levelled, that the advancing army may move more freely. Our modern Agnosticism does not speak in the old vulgar tongue of Atheism, boasting a dogmatism of negations. The Agnosticism of to-day proclaims only *the limits of knowledge*;—fit utterance for an age whose main distinction among the ages is the enlarged knowledge it has suddenly gathered. It seems as if the Agnosticism of to-day were a check on the boastfulness with which discovery encumbers the intellect,—an effective restraint on the momentum, apt to increase unduly, as we travel down towards the plain, where are spread out the attractions of the land of promise. But, under the conditions of a progress, which commonly seems to us to be slow, restraint soon becomes intolerable. The restraint must be lifted off, giving place to the freedom in which intellectual power naturally finds its true enlargement.

Serious as are the evils cleaving to Agnosticism, yet so far as it is the expression of a sceptical spirit, it is in its essential meaning only an assertion of the relativity of knowledge, thus proclaiming its limitation,—a limitation inevitable, however far our discoveries are advanced. It is a doctrine of ignorance, the need for which is being constantly illustrated along the boundary lines of all the sciences. In so far, however, as it places a barrier across the pathway of thought, it only illustrates how readily the revolutionist becomes afraid of further revolution. Cosmic forces are too strong for these artificial hindrances. Scientific men will be the first fully to recognise the futility of attempting to throw up breastworks against the progress of thought, however scientifically erected. Already they begin to feel how incongruous their position becomes. Even more than this is demonstrated in token of coming change. Huxley, after having coined for us the word 'Agnosticism,' and having gained for it a wide popularity, was himself unable to survey the progress of thought, without being constrained

to admit a change of standpoint. At its strongest, Agnosticism is only relative, and so inconclusive and temporary. The hold it has gained during a passing crisis has been too strong to warrant a sanguine expectation as to its speedy disappearance. But it has never gained dominion over the public mind, and it cannot long hold sway over the scientific. There is this advantage for the thought, and belief, and sentiment which the people have accepted, and in which philosophy has upheld them, that social progress is of all the ages, and that it advances now, as ever before, in recognition of such laws of life as justice, honesty, and fidelity,—laws known through all time, for the race did not tarry for the coming of a scientific age to know these authoritative rules of life. The power of the ethical process, through historic times, we are all acknowledging now; and its true significance appears in an ideal of rational life we, in these later times, are trying more adequately to interpret, as we contemplate the inevitable complexity of our modern social organisation.

How natural it has been for men in all ages to recognise a transcendent cause of natural processes is shown in the remote historic period which marks the dawn of philosophy in ancient Greece. When men began to reason in a philosophic spirit, their search was for a cosmology,—for some satisfactory account of the origin of the universe, and of the history of things within the cosmos. These tentative efforts were crude enough, but their illustrative value is great, when it is our special aim to trace the progress of thought. It took centuries of unsuccessful efforts at tentative hypotheses to bring the reaction which gave the world a Socrates, discoursing of the moral life of man, as of more value than all that engrossed the interest of cultured Athenians. Thinkers in the days preceding his, were occupied with the material universe,—with the elements present in Nature, which seemed to provide for the life, vegetable and animal, upon the earth. First, the moisture in the earth seemed to explain all; or it was the air, the floating vapour, which carried the nourishment of life; or it was the heat which pervaded all the world, making life

to flourish. When men reasoned even in such an inadequate style as this, and were at length compelled to own the poverty of results following on their investigation, they were nevertheless swayed by the thought that 'all things are one.' The surrender of elemental theories did not break confidence in the wider conviction. The unity of the system still stood out before men as indubitable. While they sought for the true beginning of things, the original cause of all finite being, they reasoned concerning the 'eternal, infinite, indefinite ground'[1] of all existence; not concerning 'eternal motion,' but concerning a power which is 'eternal and ageless.' What men in the early ages thus found essential to their thought, we may be assured carries evidence of the essential conditions of the rational life, conditions as applicable now, in our enlarged field of knowledge, when the great cosmic processes operating throughout the ages have at length been discovered.

The vegetable life which grows and flourishes, yielding seed after its kind, must be indigenous to the soil; so must the problems of thought arise from the conditions of thought itself, however true it be that they must be formulated according to the character of each successive age, and the measure of knowledge at command. The intellectual conditions of life are in all ages the same; these must rule procedure whatever be the stage in history; but the range of knowledge at command shapes for us the grand questions which are to be raised and answered. In our day, it is beyond doubt, that nothing effective can be done towards interpretation of the order of Nature, without reference to the cosmic process which has been at work since life appeared; nor apart from the ethical process, which had its rise when rational life had its advent, and which has been operating ever since. Our business must be to interpret the unity which is the outcome of this diversity, since these two processes became contemporaneous, and their coaction the key to a more complex system.

Our task is simplified by the historic order which gave to the cosmic process sole possession of the earth throughout

[1] Burnett, *Early Greek Philosophy*, 12; cf. 186, 283.

long ages, making the evolution of organic life the one grand achievement in history. When this wide sphere of observation lies before us, the clear induction which must guide our thoughts is the truth illustrated in the relations of all life to environment,—that *all movement is purposive, and all action of vegetable and animal life tributary to organic advance.* This truth has, indeed, been in some sort recognised in all ages, at first dimly, and, as time advanced, with increasing clearness; but it had, all the while, a deeper and grander significance than was known to those who were even the best instructed. The advance of knowledge within the last half century has brought out this truth with a vividness never before witnessed. The study of lower forms has presented it so strikingly as to assign to the protozoa a quite unexpected importance for structure of a theory of the natural history of life on the earth. In early ages, it was natural that the human race should be occupied mainly with the higher forms of animal life, being content with comparative ignorance of lower forms. On this account our race, even with its higher gifts, continued largely engrossed with its more immediate interests, while blind to the wonders of existence all around. Bees, ants, and spiders were too insignificant to have attention; when such creatures forced themselves upon notice, they were a trouble. If, indeed, there was honey to be found in store, men would turn aside to show appreciation of its sweetness. The utilities covered almost the sum total of the knowledge at command; the best that emerged was a lesson in industry which could be drawn from the ants, with their eagerness in storing. Late in the Christian era, our knowledge of life began to widen out. Interest was awakened in the variety of species, and in their relations to environment. This brought an army of observers on the field. Men of science would watch for hours, through successive days, the industry of the earthworm, and, tracing the appearance of 'vegetable mould,' would prove that earth-worms worked incessantly as auxiliaries of the husbandman. Others would plan a holiday, so as to devote continuous weeks of observation to the industries of the ants, and would bring back proof that the

formicary contains a great industrial community, working on the co-operative principle. Beyond this, the relations of the vegetable and animal kingdoms began to be patiently investigated; the result has been fresh stores of knowledge, showing how insects fertilise plants, and how plants and animals assume varied colouring, finding thus defence and help towards development. The whole surroundings, down to the minutest details, were shown to be teeming with instruction. There came forth this lesson, never dreamt of before,—never to be forgotten again,—that there is purposive action in the energy of the myriads of insects, which appear insignificant in our eyes. Their insignificance even enhances the value of their teaching. It is needful, however, to be explicit as to the significance of scientific teaching in its discovery of purposive action. It is not the purpose of the animal which has been made clear,—not the purpose of the medusa, or insect, or bird; nor is it the purpose of the horse or the dog, as connected with animal intelligence. What is made obvious is a grand sovereign purpose, operating variously but everywhere and always by fixed law, by this means unfolding a complex system, which is a grand unity. Science places beyond question, as an induction from the accumulated evidence, that all movement, mechanical and vital, is purposive, showing how all forms of activity work singly, and co-operate, for the production of ends contributing towards a system of things, providing for continual advance.

Intelligence like to our own is seen to be looking out upon us from every tuft of grass, and from every heathery knoll; from the solitudes of the forest, and from the many attractions of the shady dell. In our age, it has seemed as if a whole world of insect life had found voice, teaching lessons of wisdom which Solomon had only dimly appreciated. The testimony of insects as to the possibilities of organic life thus presents an outstanding feature in the accumulated gain of a scientific age. From this we have learned to honour the minutest life-forms, as men had never done before. The least has become instructor of the greatest, showing how sight may be without eyes; and how, without differentiation of limbs, organism may outstretch its normal

form, so grasping the food it seeks. Never before had it been known, as it is now known, that all life movement over the wide cosmos is purposive, having been made tributary to organic advance.

Agnosticism has no power in attempting to move through the midst of such discoveries. Science cannot obliterate its own testimony, or hide it away, as if it were unsuited for the popular gaze. When discoveries are verified, ordinary thought is not slow in its appreciation. The popularity of Science is the death of Agnosticism; Science remains our guide, pointing to the knowledge all receive and honour. With clearest testimony, scientific observation has led us to innumerable points, whence we have seen intelligent purpose at work providing for life yet unborn. We have been arrested first, and afterwards roused to quickened consciousness, realising that we have seen the lesson all the days of our life, in hundreds of forms, but had not read its full meaning, though it had been written large; for is not the whole vegetable kingdom confessedly a preparation for a coming life? In vain does Agnosticism lift its voice in presence of witness such as this. Testimony for an Intelligent Cause springs even from the *dust*, and, as it comes thence, thought moves freely along all the fields of science, gathering evidence as readily from the vegetable kingdom as from the animal; finding, with ever increasing surprise, a growing testimony as science conducts us lower in the knowledge of Nature. Not to the heights, but to the depths, we go, in order to witness the most startling condemnation of Agnosticism. It is not merely the myriad dwellers in the insect world which bear witness; but inanimate creation itself tells us of treasure stored in its keeping, to satisfy animal wants. 'Plants can manufacture fresh protoplasm out of mineral compounds, whereas animals are obliged to procure it ready made, and hence in the long-run depend upon plants.'[1] Thus, even from the *soil*, under our feet, comes the evidence calling us to own an Intelligent First Cause, as modern excavations amongst heaps of ruins have brought to light a literature which a highly developed criticism had declared

[1] Huxley, *Lay Sermons*, p. 138.

to be impossible of discovery. Science itself must be shown to be irrational, before religious faith and feeling can be dissevered from advance of knowledge, or the Intelligence immanent in Nature can be said to be unknown. In the discoveries of a scientific age, we have found a rational basis on which to reason of 'the Eternal, Infinite, Indefinite ground' of the existence which constitutes the cosmos, and knowledge wherewith to trace the history of the movement of the great forces in Nature.

Contemplating the long epochs throughout which the Cosmic Process has been at work, we learn that the causality in Nature shows no haste in its advance towards a consummation, for which every movement is preparing. The conspicuous features in the process are now familiar, including incessant action of environment effecting small modifications in organism, all co-operating towards accumulated gain in more complex forms of existence. Out of this familiar lesson, there comes a definite conclusion which is being silently imprinted on the common thought of men, that uncreated Intelligence has directed the cosmic process from the first. From this, the promise is that the future of our race will be more religious, and more intelligently so, than the past has been.

This conclusion is strengthened, and its promise widened, by reference to the ETHICAL PROCESS, introduced on the field of cosmic movement with the appearance of man, and which has determined human action from the age of primitive thought till now. Great as has been the impression made on the imagination by the grand movement, sustained unchecked throughout the long epochs antecedent to the presence of rational creatures, the whole scene is so changed by man's advent, that the world itself becomes a thing altogether new. With a fondness for unity in continuity, which is a phase of the conscious weakness of a limited intelligence, groping for a security which it fears to lose, we are in haste to proclaim the unification of all existence. Hence we are ready to feel as if confusion must follow upon the introduction of a process which 'means a checking of the cosmic process at every step and the substi-

tution for it of another.' When our minds have come under dominion of this conception of an irresistible cosmic process, persistent through all the ages, how ready we are to suppose that physical forces fix the destiny of all that has place within Nature! With strong sense of logical consistency, we can rebut the suggestion that it can be otherwise, calling all science to witness how the unity of procedure in Nature makes such a thing impossible. But, in all that concerns consciousness, the common thought of man is stronger than physical science, always making account largely of rational principles. The witness for an ethical process is found in primitive thought, presenting its personal claims; in heroic struggle after a nobler life, more or less common to all times; and in modern advance in beneficent forms of social organisation. Science, which has gathered evidence of purpose from an insect world, and even from the dust of the ground, cannot refuse this testimony. Common thought, guided by its fainter light, has been vindicated by the details of scientific discovery, and helped in grasping the large generalisations emerging. Popular thought would not have swerved even if this vindication had not come; for it would have had no serious misgiving as to the ultimate result. Science could not move along the road so laboriously opened, without bringing, sooner or later, the testimony now recorded. Nature is larger than a field whereon the cosmic process of Evolution has sway; History is filled with greater things than modifications of organic forms, and origin of species. We cannot say that 'there is nothing great in the world but mind'; we must say that *all* in the world is great, but mind is greatest; for by application of his intelligence man has given to Nature her grandest results.

Beyond and above the physical forces, or rather—for it is nearer the truth when it is stated so—*within* the movements of these forces of Nature, we are finding intelligent purpose. By their interpretation, we are seeing greater things; and we are moved by the sight to loftier sentiment. Besides, we have proof of the reality of an ethical process, which scientific observers have noticed, crossing the lines of the cosmic process, vanishing into undiscovered paths, reappearing at

distant points, and there promising higher results. Ethical force in Nature has its own law, as it has its own sphere of activity; it cannot be captured by physical forces, or cabined within organic form, or fed with fruits of the field. Where men bow before the authority of justice; where they feel the movements of sympathy with those who find the battle of life go hard with them; where they are conscious of the uplifting power of generous impulse, owning the sovereign law of love, there we have the evidence of the ethical process. It is traced wherever man is, whether uncivilised or civilised, most of all where he is Christianised. Could man forget his own dignity; could he disown his personal responsibility; could he surrender his claims on, or even his more restricted expectations from, his fellow-men? Only then could he fail to see, within him and around him, testimony to an Ethical Process,—a greater thing in Nature than the Cosmic Process, though this has accumulated its vast results through longer epochs.

A view of the Transcendent Cause is here breaking upon our vision. The research which brings us nearer to Nature, brings us closer to God. Thought has for a time been absorbed in new discoveries, placing the continuity of organic life fully within sight of our race. It is not saying more than the history of events requires, if we say that the result has been unsettling; that modern thought has been disturbed by sense of uncertainty, as if doubtful of the direction in which the race was to move. But, as men grow familiar with the position of things, as the morning mists begin to lift, it becomes clear in what direction our course lies.

Darwin's discovery has effected a revolution of thought even greater than he was able to forecast. In revolutionary periods, whether civil or intellectual, men do not readily get to know what the issues are. The results are, indeed, fixed and sure; but human forecasts are wavering and uncertain. Scepticism is ever stimulated to special effort in such a transition period. The dangers of a change of front are proverbial, and they prove the test of wisdom and skill. On this occasion, the sceptical movement has assumed a more powerful form, because of having sprung from a scien-

tific basis. Civil revolution, as it is more violent, expends its energy more quickly. When the character of a revolution of thought is considered, we cannot marvel that the disturbing effect has been great and widespread. Observations in the field of natural history have contributed from the one side; investigations into the secrets of organic structure have added further testimony from the other. At an opportune point, the juncture of these took place, and immediately the united power of these two currents of thought was such, that it seemed to many as if old beliefs had been carried away. There never has been a more vivid illustration of the bewilderment of the senses by the rush of the waters. Evidence of this has appeared in the fact that highly disciplined minds heralded Agnosticism, as if it were something positive and permanent; pitching their camp for a time on a barren moor, as if purposing an abiding settlement there. Still more startling has been the fact, that in an hour of passing exaltation, highly trained intellects fancied they saw the Supernatural driven back before the force of natural law, not fully realising that it was only knowledge of the natural which was being slowly extended. Even according to their own showing, the Supernatural had never been within their sight, but only certain phases of human ignorance and superstition; the 'driving back' of some great Power was a myth. In reality, Science was only driving before it the errors of a bygone age,—errors of natural ignorance, till light of discovery dawned. In this dawn a new hope awakes and expands. Only in this spreading light, can present movements be accurately interpreted. That the Supernatural was being driven back is one of the weakest delusions of the age, of which we shall all presently feel ashamed.

Evidence for an Intelligent First Cause has been immeasurably extended by recent discoveries, for these have given us greatly enlarged knowledge of Nature. The time is near when the sense of a strengthened faith will extend. At every point, the Supernatural has come more obviously into view, drawing more close to human life than could have been in absence of a deeper knowledge. The surface covering

of Nature has been skilfully removed, allowing the ordinary observer to see processes which have been going on unceasingly since early ages. This revelation has borne us onward to a new standpoint, without changing the direction or significance of our advance. It has communicated freshness and new force to the thought which has hitherto been powerful in morals and religion. A deeper insight into the system of things in Nature, the human race has never before had. We are now nearer the centre of things, and of necessity nearer to the source. To consider the old cosmologies of the Ionic school, in the early days of the philosophic thought of Greece, to which a passing allusion has already been made, is to be impressed by the large advance effected, bringing us into closer sympathy with Nature in the persistence of its purposive action.

The most urgent demand now is a fuller appreciation of the COSMIC PROCESS, which has yielded its marvellous results in evolution of organic structure, and of the ETHICAL PROCESS, carrying human rights through troublous times, bearing social organisation to a higher level, and unfolding a grander benevolence, full of promise for the general good. There is need for a more comprehensive view of the *combination* of these two processes. The incompleteness of our present-day thought is apparent. We are even now looking at each process apart, and more particularly at that most novel to us, as if it were a *separate object* of interest. Of necessity, it happens in this situation of things, that those who have been largely absorbed with the ethical process experience special difficulties in assigning its historic place to the cosmic process. But equivalent difficulties are encountered on the other side. Completion of the work which has roused the energies of our times requires a wider induction, which may bring to unity our conception of a Universe in which both processes are in harmony. The Cosmic process, working slowly towards realisation of the perfection of organic structure, at first had complete dominion. The Ethical process, moving towards the perfection of a rational life, entered the field later, working for the unfolding of that life which is higher than the organic. The two processes,

each operating apart in its own sphere, yet acting unitedly in the cosmos, give us the true conception of the World in which men essay their part as workers, and *do* their part too, in more or less effective way, if they be not dragged from their position of honour by a spirit of self-indulgence, spreading painful evidence of the 'sacrifice of life' along the line of march of the great army.

However it fare with the rational life in the world, which makes way only under subjection to many reverses, the witness of science is clear as to 'survival of the fittest,' while advance of common thought is sustained by reverence for Justice and Benevolence. There is a contrast between these two processes in respect of their significance, for the one is a *thought-problem,* the other a *life-problem,* each of which must be dealt with singly, before they can be brought to coalesce. But our statement must be still enlarged, for there is no life-problem which is not also a thought-problem; comprehensiveness of the thought-problem must include the complexities of the rational life. In the force of constructive thought, we trace the evidence for the unity of our race.

To complete this brief study of outstanding cosmic problems, it must be obvious that if we regard the Cosmic process as having been persistent, since life appeared on the earth, and the Ethical process as contemporaneous with it, since the advent of Man, we own two beginnings in Nature's procedure, appearing at periods remote from each other, the later so differing from the earlier as to be at variance with it at every step. Yet is this variance without risk of confusion. There is in truth security for true harmony, because this ethical process, applicable exclusively to a new order of life, is placed in vital relation with the animal kingdom. If, with this latest reading of the orderly system in the universe, we admit Nature's unity, we do so only as we trace both to a common Cause,—a Transcendent Intelligence,—working out His will by the whole range of purposive action, so including in one scheme the forces of Nature,—the movements of all Animal Life, and the intelligent activity of Responsible Agents.

That religious faith and sentiment have had opened for

them a wider foundation in Nature, by a more extended and a fully verified knowledge, is very obvious. The forecast has little of uncertainty hanging over it. Religious faith will be strengthened by the extending influence of Science; and the pre-eminence of Christianity,—not as a rival religion, but as the fundamental religion,—will be acknowledged,as the world's grandest force operating towards realisation of social good. Religion becomes greater, as knowledge becomes larger.

It does not seem unwarranted or presumptuous to say, that as in man the immanent intelligence transcends unspeakably the organism, so in Nature itself, the Immanent Intelligence, ever looking out upon us, giving us deeper insight into the meaning of the past ages, is also Transcendent, ever leading rational creatures into enlarged expectations.

A Monistic scheme of thought, which would annihilate the distinction between Natural and Supernatural, is alien to the system of things, of which Science is slowly working out the interpretation. The phenomena of reproduction, over-production, struggle for existence, survival of the fittest, death of the weakest, are all antagonistic to the representation which would identify the Eternal with the Changeable. In tracing the evidence for the Cosmic Process, which, by action of Environment on sentient existence, provides for Evolution of organic structure, Science has come to recognise the Ethical Process, distinct and apart from the other, applicable solely to rational agents, who are subject to higher law. The ethical conceptions of right, duty, and responsibility are vindicated; and with these the acknowledged basis of our Religious Life is seen to be involved, being unfolded in accordance with the conditions of thought, in sight of the requirements of ethical law, of which Justice and Benevolence are conspicuous examples.

Standing on the confines of the existing order, in which these two processes are at work, the light now shining on Nature shows with increasing clearness the warrant for our expectations beyond the present. This earth is, indeed, but a speck in the ocean of existence, yet it belongs to the grand whole. From its insular position, we can in some measure judge of the vast system of which it is a part. The Law of

Advance now recognised, and filling us with wonder and admiration, belongs to the Divine plan, which we may venture to think holds in all worlds, where Life has its eventful history. In the heart of this great system lie the cherished hopes of Humanity. The Ethical Process, working out its results, with whatsoever of penalty and whatsoever of reward are around us, carries thought into the unknown Future. The law determining progress here, we may be well assured, holds throughout the Universe, wherever rational agents are. Assuredly, continuity of life implies continuance of its laws. Our forecast of the future is, indeed, but limited; our *maximum visibile* encloses but a small circumference, yet is its area expanding, as life is borne to higher altitudes. As sovereign power is ever working for righteousness, the vision of progress has no boundaries save those which come from limitations of its own faculty. Hope brightens with widening range of view. As the sun sends its brilliance back over the scene from which it is departing, while spreading its splendours over regions beyond, so does the light of Science shine, not only on past ages, but on remote heights, towards which men are travelling, to rejoice there, as here, in the one grand Law of Advance, guiding Life throughout all the Universe.

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